VOL. XXXII JULY 1948 NO. 3

THE JOURNAL OF AGRICULTURE

of the

UNIVERSITY OF PUERTO RICO

THE INSECTS OF PUERTO RICO

By *George N. Wolcott*

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PUBLISHED BY
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THE JOURNAL OF AGRICULTURE
OF THE UNIVERSITY OF PUERTO RICO

Issued quarterly by the Agricultural Experiment Station of the University of Puerto Rico, for the publication of articles by members of its personnel, or others, dealing with any of the more technical aspects of scientific agriculture in Puerto Rico or the Caribbean Area.

Vol. XXXII July, 1948 No. 3

DIPTERA

Two-winged Flies

As early as 1794 and 1805, Fabricius named and described flies from the Island of St. Thomas in the Virgin Islands. The earliest extensive records of Diptera from Puerto Rico, however, are the determinations and descriptions published by Herr Victor von Roeder: "Dipteren von der Insel Portorico" (Stettiner Entomologische Zeitschift, 337–349. Stettin, 1885) of the collections made by Dr. Juan Gundlach. Those made by Mr. August Busck in 1899 were listed, or described if new, by Mr. D. W. Coquillett in a "Report on a Collection of Dipterous Insects from Porto Rico" (Proc. U. S. National Museum, **22:** 249–270. Washington, D. C., 1900). All of these earlier records are given by Dr. J. M. Aldrich in his "Catalogue of North American Diptera" (Smithsonian Misc. Collections, **46:** (1444): 1–680. Washington, D. C., 1905). Dr. F. M. Root, of the School of Hygiene and Public Health at John Hopkins University, primarily interested in mosquitoes and flies as disease vectors, published "Notes on Mosquitoes and other Blood-Sucking Flies from Porto Rico" (Amer. Jour. Hygiene, **2** (4): 394–405, fig. 5. Baltimore, July 1922) after an extended survey in person.

Dr. C. H. Curran began describing "New Diptera from the West Indies," all of which were from Puerto Rico (American Museum Novitates No. 220, pp. 1–14. New York, June 19, 1926), continued with "New Neotropical and Oriental Diptera in the American Museum of Natural History" (American Museum Novitates No. 245, pp. 1–9, fig. 1. New York, January 27, 1927), but did not complete his account of the "Diptera or Two-winged Flies" for the Scientific Survey of Porto Rico and the Virgin Islands, **11** (1): 3–118, fig. 38, ref. 19. New York Academy of Sciences, New York, 1928, as this was followed by a "First Supplement of the Diptera of Porto Rico and the Virgin Islands" (American Museum Novitates No. 456, pp. 23, fig. 4. New York, February 11, 1931) and by several other papers on the members of the Tachinidae, Dolichopodidae, and Syrphidae. Prof. O. A. Johannsen of Cornell University published descriptions of "New Species of Nemocera from Puerto Rico" (Jour. Agr. Univ. P. R., **22** (2): 219–225. Río Piedras, May 1938).

Tipulidae: Craneflies

Dolichopeza (Megistomastix) acutiloba is one of the "New or little-known Species of West Indian Tipulida (Diptera) II" (Jour. Agr. Univ. P. R., **21**(2): 179–190, pl. 1. Río Piedras, July 1937) described by Prof. C. P. Alexander from material collected by Don Julio García-Díaz on El Yunque while making "An Ecological Survey of the Fresh Water Insects of Puerto Rico" (Jour. Agr. Univ. P. R., **22** (1): 43–97, pl. 7, ref. 44. Río Piedras, April 15, 1938), and listed by him in his "Appendix A" (pp. 94–96).

Dolichopeza (Megistomastix) obtusiloba Alexander (1937–180) is also described from material collected by Don Julio on El Yunque: "general color brown, the praescutum with four paler stripes, length, 7.5 mm., characters very similar to those of *acutiloba*, differing especially in the structure of the male hypopygium."

Dolichopeza (Megistomastix) portoricensis, described (as a *Megistomastix*) by Prof. C. P. Alexander as "A Peculiar new Crane-fly from Porto Rico" (Psyche, **19**: 63–66, pl. 1. Cambridge, 1912) was also from El Yunque, collected by C. W. Richmond at an elevation of 2,800 feet, February 20, 1900. It is "the smallest Tipuline species in the Island", with "apically hairy wings, with a peculiar veination, and characterized by the greatly elongated antennae of the male."

Megistocera longipennis Macquart, first collected in Puerto Rico by Dr. Gunlach and noted by him "no es rara," was identified by von Roeder (1885-338) as a *Tipula*. Since Gunlach's time, however, it has not been collected in Puerto Rico, which seems rather surprising as it is "one of the two largest Tipulidae of the Greater Antilles" according to Prof. Charles P. Alexander, writing of "The Crane-Flies of Puerto Rico" (Jour. Dept. Agr. P. R., **16** (4): 347–387, p. 6. San Juan, February 1933).

Brachypremna unicolor described by Baron C. R. Osten Sacken in his "Studies on Tipulidae" (Berliner Entomologische Zeitschrift, **31**: 329–40. Berlin, 1887) from three males collected in Puerto Rico in 1835 by Herr C. Moritz, has not since been found here, altho abundant in Hispaniola and Cuba, and since recorded from Grenada.

Limonia (Limonia) hoffmani was named by Prof. C. P. Alexander in "Records and Descriptions of Neotropical Crane-flies (Tipulidae, Diptera) III" (Jour. N. Y. Ent. Soc., **35** (3): 265–6. New York, September 1927) for its collector, Dr. W. A. Hoffman, who first found it on El Yunque, and later at Villalba at an elevation of only 1,600 feet. Apparently it is quite common at the higher elevations, having also been found at Las Cruces, elevation 1,300 feet, and at Indiera, equidistant from Lares, Yauco and Maricao, in an abandoned coffee grove.

Limonia (Neolimnobia) diva (Schiner), was collected on El Yunque by Dr. M. D. Leonard, according to Prof. Alexander (1933-357), and was since found by Don Julio there.

Limonia (Dicranomyia) brevivena (Osten Sacken), subspecies **torrida** was described by Prof. C. P. Alexander (1933-358) from material collected at Puerto Real on Vieques Island by Dr. M. D. Leonard, "differing from typical *brevivena* O. S. chiefly in the details of body-coloration."

Limonia (Dicranomyia) distans (Osten Sacken), a Tipulid with "general coloration brown, with a sparse golden-yellow pollen" occurring from the southern United States to Paraguay, has been found by Dr. M. D. Leonard on Vieques Island, and at Río Piedras in Puerto Rico.

Limonia (Dicranomyia) divisa Alexander is a yellow Tipulid from eastern North America, "recurring in the mountains of Hispaniola and Puerto Rico," at El Yunque and Villalba.

Limonia (Rhipidia) domestica (Osten Sacken), occurs from the southern United States to Argentina, and has been noted at numerous localities in Puerto Rico, as well as on Vieques Island by Dr. M. D. Leonard. It is readily distinguished, according to Prof. Alexander (1933–360), "by the coloration of the antennae, the two subterminal segments being pale yellow, contrasting abruptly with the blackened remainder."

Limonia (Rhipidia) tetraleuca was described by Prof. Alexander (1937–182) from material collected by Don Julio García-Díaz on El Yunque, with "antennae brown, with four subterminal segments white."

Limonia (Geranomyia) antillarum Alexander has been collected at Coamo Springs, Villalba and elsewhere in Puerto Rico, and intercepted in a grapefruit grove at Bayamón, mis-identified as the more northern *L. (G.) rostrata* Say.

Limonia (Geranomyia) cinereinotata (Alexander) is a cranefly with black head, "enclosing a silvery triangle," which occurs in northern South America "northward in the Antilles to Puerto Rico and Hispaniola." Previously recorded by Prof. Alexander (*in* Curran 1928–9) as his *Geranomyia domingensis* from Mameyes, it has since been taken at Rio Piedras and on El Yunque.

Limonia (Geranomyia) myersiana Alexander, known only from Cuba and Puerto Rico, was found by Dr. M. D. Leonard on El Yunque (Alexander 1933–363), and by Dr. W. A. Hoffman at El Semil, Villalba.

Limonia (Geranomyia) rufescens, originally described from Puerto Rico by Hermann Loew as an *Aporosa:* "Beschreibung einiger neuen Tipularia terricola" (Linnaea Entomologica, **5**: 385–406. 1951. see p. 396, fig. 9-12 of pl. 2), was listed by Herr Roeder, and noted by Dr. Gundlach: "el ejemplar típico era de Puerto Rico. Hasta ahora no se ha encontrado en

otras islas." Not only has this species not been found in other islands, but it has not since been found in Puerto Rico, and Prof. Alexander (1933–363) notes its possible synonymy with Loew's *tibialis*.

Limonia (Geranomyia) subrecisa was described by Prof. Charles P. Alexander (1933–364) from material collected by Dr. M. D. Leonard on Vieques Island, being most similar to his *recisa* of Central America.

Limonia (Geranomyia) tibialis (Loew), "originally described from Brasil, but not known to have a vast range in the neotropics" according to Prof. Alexander (1933–365), was collected by Dr. M. D. Leonard on Vieques Island, and in Puerto Rico was found by Don Julio (1938–95), and by Dr. W. A. Hoffman at Villalba.

Limonia (Geranomyia) virescens (Loew), originally described from St. Thomas, is somewhat doubtfully applied by Prof. Alexander (1933–365) to craneflies from Las Cruces, but later this determination was given definitely to Dr. W. A. Hoffman for material he had found at El Semil, Villalba.

Helius (Helius) albitarsis, described as a *Rhamphidia* from Puerto Rico by Baron C. R. Osten Sacken (1887–184), has since been repeatedly found on El Yunque.

Polymera (Polymera) geniculata, described by Prof. Charles P. Alexander (Insecutor Inscitiae Menstruus, **3**: 106–7. Washington, D. C., 1915), the type from Carolina, Puerto Rico, in crab holes under rocks, has since been "reared by Dr. W. A. Hoffman from a pupa taken February 20, 1927 in an eddy of a rapidly flowing rocky stream at Barranquitas," according to Prof. Alexander (1933–367), and is also listed by Don Julio (1938–95).

Shannonomyia hoffmani, included among the "New or little-known Species of West Indian Tipulidae (Diptera) I" (Jour. Agr. Univ. P. R., **20** (4): 877–882, fig. 4. Río Piedras, January 1937) described by Prof. Charles P. Alexander, was named for the collector. It is a grey cranefly, associated at light on El Yunque with the pale yellow *S. leonardi*.

Shannonomyia leonardi, described by Prof. Charles P. Alexander (1933–368) from material collected on El Yunque by Dr. M. D. Leonard, is a pale yellow cranefly with spotted wings, since listed by Don Julio (1938–95).

Shannonomyia triangularis, described as a *Pilaria* by Prof. Charles P. Alexander (1927–270), the type collected on El Yunque by Dr. W. A. Hoffman, is "known only from Puerto Rico and apparently restricted to the mountainous section of the Luquillo National Forest" according to Dr. Alexander (1933–369). It is listed by Don Julio (1938–95) without specific locality.

Hexatoma (Eriocera) ocellifera, described as an *Eriocera* by Prof.

Charles P. Alexander (1915–104) from a unique type collected by Mr. R. H. Van Zwaluwenburg at Mayagüez, has not since been found anywhere.

Hexatoma (Eriocera) trifasciata, described as an *Eriocera* by Herr Victor von Roeder (1885–338) from a unique type collected by Dr. Gundlach, presumably at or near Mayagüez, has since been found at Las Mesas, near Mayagüez, over a quiet pool in a small stream at an elevation of 900 feet by Mr. A. H. Madden, and on El Yunque by Don Julio García-Díaz, according to Prof. C. P. Alexander as recorded on page 126 in "New or little-known Species of West Indian Tipulidae (Diptera) IV" (Jour. Agr. Univ. P. R., **23** (2): 91–130, pl. 2. Río Piedras, September 7, 1939).

Gnophomyia (Gnophomyia) diazi was described and named by Prof. Charles P. Alexander (1937–184) after Don Julio García-Díaz, who collected the type female on El Yunque, a black cranefly about 5.0 mm. long, June 7, 1935 at light.

Gonomyia (Lipophleps) bicornuta Alexander (1927–276), the type from El Yunque, has since been repeatedly collected there.

Gonomyia (Lipophleps) bifiligera Alexander (1933–372), the type from Las Cruces, Puerto Rico, has since been found at El Semil, Villalba.

Gonomyia (Lipophleps) monacantha, described by Prof. Charles P. Alexander (1937–184) as differing from the cosmopolitan *G. (L.) helophila* Alexander "chiefly in the structure of the male hypopygium, notably of the outer dististyle," the type from Vieques Island, is abundant in Puerto Rico, collections having been made by Prof. James G. Needham and Don Julio García-Díaz at Lares, the Río Blanco and Río Yúnez. Previous records of *G. (L.) helophila* from Vieques Island and Santurce, Puerto Rico by Prof. Alexander (1933–373), and at Coamo by him (*in* Curran 1928–9), are mis-identifications of this local species, and are to be referred to it.

Gonomyia (Lipophleps) orthomera Alexander (1937–185), the type from Río Tanamá, others from Río Cidra, collected by Prof. Needham and Don Julio, is a yellow cranefly, 4.5 mm. long, with thorax variegated by brown.

Gonomyia (Lipophleps) pieuralis (Williston) is a common neotropical cranefly, first collected in Puerto Rico at Aguadilla by Mr. August Busck, and reported by Mr. D. W. Coquillett as an *Atarba* (*Gonomyia*) and since, according to Prof. Alexander (1933–374), found at Coamo and Santurce. It is characterized by a dark brown stigmal area. Don Julio (1938–95) lists it as having been collected by him, but without noting the locality.

Gonomyia (Lipophleps) producta Alexander, originally described from Antigua, was collected on Vieques Island by Dr. M. D. Leonard, according to Prof. Alexander (1933–374).

Gonomyia (Lipophleps) subterminalis Alexander (1927–175), described from a male collected by Dr. W. A. Hoffman on El Yunque, and most

abundant there, has been found at Las Cruces, at an elevation of 1,300 feet, according to Prof. Alexander (1933–374). It is also listed by Don Julio (1938–95).

Teucholabis (Teucholabis) portoricana Alexander (1937–880) was described from a male collected by Dr. W. A. Hoffman at El Semil, Villalba, differing from *T.* (*T.*) *myersi* of Cuba and southern Florida chiefly in the structure of the male hypopygium.

Trentepholia (Paramongoma) niveitarsis, described as a *Mongoma* by Prof. Charles P. Alexander in "A Synopsis of Part of the Neo-Tropical Crane-Flies of the Subfamily Limnobidae" (Proc. U. S. National Museum, **44** (1966): 501. Washington, D. C., April 30, 1913), the type from El Yunque, is, so far as known, found only in the Luquillo Mountains. Prof. Alexander (1933–375) identifies a single broken male from the Blue Mountains of Jamica as "what appears surely to represent this same species."

Polymeda (Mesocyphona) caloptera (Say) is a widely-distributed cranefly of the eastern United States, of which specimens which have "the white wing spots somewhat more reduced in area," according to Prof. Alexander (1933–377), have been found on El Yunque.

Polymeda (Mesocyphona) portoricensis (Alexander) (1933–377), the type from El Yunque, others from Las Cruces, is known only from Puerto Rico. It is listed by Don Julio (1938–95), as an *Erioptera.*

Toxorhina (Toxorhina) fragilis, originally described by Herr Hermann Loew (1851–401) from a type female collected in Puerto Rico by Moritz, is listed by Herr von Roeder and by Dr. Gundlach, who notes: "El tipo era también de Puerto Rico, donde solamente ha sido observado la especie." Prof. Alexander (1933–378) re-describes what he presumes to be this species from Cuban and Hispaniolan males, none of either sex having been found subsequently in Puerto Rico.

Blephariceridae

Paltostoma argyrocincta Curran (1927–1), "opaque black or brown, with silvery white areas apparent from different views, length about 4.5 mm.; scutellum brown, narrow, shaped like the 'cap' of a broadly opened 'toad-stool;' thorax (and abdomen) without trace of hairs," was described from material collected by Dr. Frank E. Lutz at Río Grande. It has since been collected by Prof. James G. Needham and Don Julio García-Díaz on El Yunque and from the Río Sabana, as noted by Prof. O. A. Johannsen (1938–223).

Psychodidae: Moth Flies

Telmatoscopus albipunctatus (Williston), the common large moth fly of Puerto Rico, has repeatedly been noted here since its original identi-

fication as a *Psychoda* by Dr. J. M. Aldrich in 1922, and as a *Pericoma* by Dr. C. H. Curran in 1930. Its very elongate black maggots are sometimes to be found in enormous numbers in containers of dirty water, wiggling at or near the surface, with adults continually emerging and climbing up the side. The adults have feathery white antennae, white tarsi and spines on the legs, and white spots on the wings, surprisingly beautiful and delicate in contrast with the disgusting habitat of the larvae, which have been reared on a dead cockroach and other insect debris in water, and are commonly found feeding on liquid manure or the slime that accumulates in poorly designed plumbing.

Psychoda alternata Say, as determined by Dr. Alan Stone from specimens intercepted on "palo de mato" (*Adenanthera pavonina*) in Bayamón, is not an indoor species.

Psychoda severini listed by Dr. Stahl as *Psychoda phalaenoides* L., is a smaller, less decorative species, of which one or two adults are often noted lurking about the drain of a wash basin.

Maurina hirta, described by Prof. O. A. Johannsen (1938–224) from larvae, pupae and adults collected by Prof. James G. Needham and Don Julio García-Díaz at the Río Guaynabo and Río Yúnez, differs from *Maurina angustipennis* Williston of St. Vincent, which has the wings uniformly covered with black hair, in that its wings are hairless, "basal sections of R_3 and M_2 obliterated."

Of **Phlebotomus cayennensis** Floch and Abonnene, G. B. Fairchild and Marshall Hertig described (Annals Ent. Soc. America, **41** (4): 462–4. Columbus, December 1948) the new subspecies **puertoricensis** from material collected in caves and hollow "bucare" trees at Lares in the summer of 1947 by José Romero and H. Trapido, and **viequesensis** from material collected in a tree hole near Laguna Yanuel and the old Spanish fort at Isabel II, Vieques Island, in June 1947 by J. Andrews and H. Trapido.

Tendipedidae (Chironomidae): Midges

Pentaneura marmorata was described by Prof. O. A. Johannsen as one of his "New Species of Nemocera from Puerto Rico" (Jour. Agr. Univ. P. R., **22** (2): 219–225. Río Piedras, May 1938) from material collected by Prof. James G. Needham and Don Julio García-Díaz from the Río Cidra, March 23, 1925. It is a pale yellow midge with white halteres, 2.5 mm. long.

Pentaneura monilis (L.), variety **peleensis** Walley came to light at Tortuguero Lagoon, August 15, 1935, according to Prof. Johannsen (1938–220).

Coelotanypus insulanus was described by Prof. O. A. Johannsen (1938–220) from females taken at the Río Yúnez by Prof. Needham and Don

Julio, August 11, 1935: a yellowish midge with reddish brown thorax, length 2.2 mm.

Coelotanypus concinnus (Coquillett), originally described from Florida, was attracted to light at the Cartagena Lagoon, as identified by Prof. O. A. Johannsen (1938–220).

Cardiocladius obscurus Johannsen was also attracted to light at the Cartagena Lagoon, August 9, 1935, as identified by Prof. Johannsen (1938–220).

Cricotopus aberrans was described by Prof. O. A. Johannsen (1938–220), the type from Río Tamaná, others from Río Yúnez and Río Cagüitas: a small yellow midge, 1.8 mm. long, with abdomen mostly brownish, halteres white.

Cricotopus conformis, described as a *Crictopus* by Dr. C. H. Curran (1928–12), the type from Guane, Cuba, others from Manatí, Puerto Rico, is characterized by having the "tibiae whitish, the apical third or less of the anterior pair blackish; femora blackish, the narrow bases reddish; length 2.75 to 3 mm." This brownish midge was found by Prof. Needham and Don Julio at Lares and on the Ríos Yúnez, Tanamá and Cidra, according to the identifications of Prof. Johannsen (1938–221).

Cricotopus insolitus, described as a *Crictopus* by Dr. C. H. Curran (1928–11), the types from Mayagüez, others from Manatí, has "all the tibiae whitish" and is from 2.0 to 2.25 mm. long. It was collected by Prof. Needham and Don Julio on El Yunque, and on the Ríos Cidra, Yúnez and Tanamá, according to Prof. Johannsen (1938–221).

Corynoneura (Thienemaniella) similis Malloch was taken at light near the Río Cidra and the Río Yúnez by Prof. Needham and Don Julio, as identified by Prof. Johannsen (1938–221).

Pseudochironomus fulviventris Johannsen was taken at light at El Yunque and on the Río Yúnez by Prof. Needham and Don Julio, according to the identifications given by Prof. Johannsen (1938–221).

Tendipes (Stenochironomus) furcata was described by Prof. O. A. Johannsen (1938–221) from material collected on El Yunque, characterized by the "lack of wing bars, combined with the peculiar furcate dististyles."

Tendipes anonymus, originally described from St. Vincent by Prof. S. W. Williston as a *Chironomus*, is recorded by Mr. W. V. Tower (1912-6) as having been reared from water in old pail, at Mayagüez.

Tendipes bulbosa (Garry), originally described as a *Chironomus* from Cuba, was collected from Guánica, Cartagena and Tortuguero Lagoons, and from the Río Yúnez by Prof. Needham and Don Julio according to Prof. Johannsen (1938–222).

Tendipes redeuns (Walker), reported by Mr. D. W. Coquillett (1900–

250) as a *Chironomus* collected by Mr. August Busck in Puerto Rico, has not since been found here.

Tanytarsus (Rheotanytarsus) meridionalis, a pale yellow midge with the abdomen somewhat greenish, at least when the insect is alive, was described by Prof. O. A. Johannsen (1938–222) from a great abundance of material collected by Prof. Needham and Don Julio, the type from Río Yúnez, others from Río Cidra, Río Tanamá, Quebrada Jobo, and such widely divergent environments as the Luquillo Mountains and Tortuguero Lagoon.

Heleidae (Ceratopogonidae): Punkies

Culicoides furens (Poey), originally described from Cuba (1853–236), was first recorded from Puerto Rico by Dr. F. M. Root (1922–396) as being "the common sand-fly of the coastal region." In "A Review of the Species of Culicoides of North and Central America and the West Indies" (Amer. Jour. Hygiene, **5** (3): 274–301. Baltimore, 1925), Dr. W. A. Hoffman notes specific localities of collection: Río Piedras and Aguirre, and later wrote: "This species is common everywhere near the sea; reared from larvae at and above tide level in the Condado Lagoon, 1928, and in small pools at Escambrón, 1933. It is a vicious biter," and when the wind is not blowing makes life almost unsupportable along the north coast from the Condado, thru Ocean Park and the region on all sides of Laguna San José, to Boca Cangrejos, Laguna Quiñones, Loíza Aldea and in mangrove swamps near Pt. Picúa, Fajardo and Humacao Playa, to people who are susceptible to its bite. When the wind blows, these minute little flies take shelter close to the ground, and will be noted only by barefooted persons resting on the grass, but as the breeze fades in the late afternoon they venture forth, sometimes flying as high as the second stories of houses. They are small enough to penetrate the mesh of all ordinary mosquito bars, and only the finest muslin will protect helpless babies from their attack. Much of the region where they are most abundant appears to be desirable residential region, but in fact is uninhabitable by persons who are most allergic to their bites. "The Effect of Chloroform on some Insect Bites" (Science, **94** (2429): 66. Lancaster, July 18, 1941) is claimed by Dr. W. A. Hoffman to be most prompt in relieving local annoyance, being most effective if applied promptly, and superior to carbon tetrachloride. It is especially recommended for use against this species of punkie, which is cited as being "common and annoying along the costal plain." The most optimistic persons living in the heavily infested region of north Puerto Rico hope that this plague will be abated as more houses are built, but until the margins of the near-by swamps are eliminated, the influx of

additional people only serves to provide additional hosts to be annoyed. Of all the numerous chemicals tested during World War II to protect soldiers of the U. S. Army against attack by punkies in other swampy areas of the world, the most promising is dimethyl phthalate alone, or mixed 6:2:2 with 2-ethyl-1, 3-hexanediol and indalone (n-butyl mesityl oxide oxalate). The commercial availability of such chemicals is no longer restricted to the armed forces. "Eveready" formula No. 612, manufactured by the National Carbon Company, Inc., of New York, is 1,3 ethyl hexanediol, and "Dimelone," manufactured by Dodge and Olcott Company, is bicyclo-(2,21)-5-heptene-2,3-dicarboxylic acid, dimethyl ester. Both of these compounds show high efficiency against punkies and mosquitoes, both are poorly absorbed by the skin, and both possess an odor not highly objectionable to most people. For efficiency and safety, there is little or no difference between them.

Culicoides borinqueni, described by Drs. Irving Fox and W. A. Hoffman as one of "New Neotropical Biting Sandflies of the Genus Culicoides (Diptera: Ceratopogonidae)" (P. R. Jour. Public Health & Tropical Medicine, **20** (1): 108–11, fig. 5. San Juan, September 1944) found in Puerto Rico, is from a type collected at Palmas Abajo.

Culicoides (Hoffmania) inamollae Fox and Hoffman (1944–110) is described from material collected at Mayagüez by Dr. George S. Tulloch.

Culicoides guttatus (Coquillett) is re-described and illustrated by Dr. Irving Fox from material collected at Camp Tortuguero in his "Notes on Puerto Rican Biting Midges or Culicoides (Diptera: Ceratopogonidae)" (Bulletin Brooklyn Ent. Soc., **44** (1): 29–34, pl. 1, ref. 4. Brooklyn, February 1949.)

Culicoides hoffmani Fox, originally described from Camuto, Trinidad, from a single female, has subsequently been associated with the male by Dr. Fox (1949–29) from material reared from tree-hole débris at Mameyes and Luquillo.

Culicoides loughnani jamaicensis Edwards has male and female associated and re-described by Dr. Fox (1949–32) from material taken in a light-trap at Sabana Seca.

Culicoides trilineatus Fox, originally described from St. Thomas, has male and female associated and re-described by Dr. Fox (1949–30) from material reared from tree-hole débris at Luquillo.

Culicoides phlebotomus (Williston), described originally as a *Ceratopogon* from St. Vincent, was identified by Dr. J. M. Aldrich from specimens collected on the beach at Mameyes, and by Prof. O. A. Johannsen from others on the beach at Pt. Cangrejos. As to the comparative abundance of these species of "las plagas o jején" in Puerto Rico, no estimate is possible. To aid in their more rapid identification, however, Dr. Irving

Fox has published on "The Respiratory Trumpet and Anal Segment of the Pupae of some Species of *Culicoides* (Diptera: Ceratopogonidae)" (P. R. Jour. Public Health & Tropical Medicine, 17 (4): 412–425, pl. 2. San Juan, June 1943), based on material collected and mounted by Dr. W. A. Hoffman, of which illustrations had been made by Dr. F. M. Root.

Helea (Brachypogon) impar, described as a *Ceratopogon* by Prof. O. A. Johannsen from material collected by Prof. James G. Needham and Don Julio García-Díaz on El Yunque, has a black thorax, with the antennae, legs and most of the abdomen yellowish, length 0.8 mm.

Ceratopogon punctipennis Williston and **Ceratopogon sequax** Williston, both originally described from St. Vincent, were listed by Mr. D. W. Coquillett (1900–250) as having been collected in Puerto Rico by Mr. August Busck.

Atrichopogon sp., as identified by Dr. Alan Stone, was intercepted on cactus blossom at Barceloneta.

Forcipomyia eriophora (Williston), as identified by Dr. J. M. Aldrich, was repeatedly noted in Puerto Rico before listed as *Ceratopogon* by Dr. C. H. Curran (1928–11) from Mayagüez and the Dominican Republic. Dr. Richard T. Cotton first saw these flies, black with white markings, "with their mouthparts firmly fixed in tobacco hornworms, feeding voraciously, their bodies so distended with the body juices of the host as to be quite green, and so intent on feeding as to be quite sluggish and not easily disturbed." Tobacco hornworms, the larvae of *Phlegethontius sextus jamaicensis* Butler, appear to be the only caterpillars attacked. Half a dozen or more flies attacking a single hornworm at one time have subsequently been noted by Messrs. E. G. Smyth and Francisco Seín Jr.

Forcipomyia flava (Williston) was identified by Dr. Alan Stone from material collected by Dr. Harry Pratt at Tortuguero Lagoon. *Forcipomyia galapagensis* (Coquillett), *F. erucicida* Knab and *F. crudelis* Knab are in synonymy with this fly, originally described from St. Vincent.

Forcipomyia pergandei (Coquillett) was identified by Prof. O. A. Johannsen from larvae, deeply constricted between segments, with two white balls on most segments sticking up above the general level of the insect, abundant on rotten ñame (*Dioscorea* sp.) at Isabela, and later found on rotten banana corm at Río Piedras. The pupae are formed with the anterior end sticking out of the larval skin.

Forcipomyia propinqua (Williston) was identified by Dr. Alan Stone from material intercepted at Mayagüez by Mr. A. G. Harley: a species originally described as a *Ceratopogon* from St. Vincent.

Forcipomyia raleighi Macfie was identified by Dr. Alan Stone from material collected at Tortuguero Lagoon by Dr. Harry Pratt.

Stilobezzia coquilletti Keiffer was identified by Dr. Alan Stone from specimens intercepted in a grapefruit grove near Arecibo, and in a grapefruit grove near Añasco by Mr. A. G. Harley.

Culicidae: Mosquitoes

Dr. Harry D. Pratt of the U. S. Public Health Service, stationed in Puerto Rico for five years (1941–46), is expecting to publish as complete and definitive a report on the mosquitoes of the Island as the extensive and intensive investigations of many specialists now makes possible. This is to appear in the "Puerto Rican Journal of Public Health and Tropical Medicine" of the School of Tropical Medicine in the near future. In anticipation of this publication, the present treatment of the Culicidae here is merely an outline, in extent not to be considered as an index of the relative or economic importance of the family.

Chaobrus (Sayomyia) brasiliensis (Theobald) was first recorded from Puerto Rico, at Mayagüez by Dr. G. S. Tulloch discussing "The Mosquitoes of Puerto Rico" (Jour. Agr. Univ. P. R., **21** (2): 137–169, fig. 9, ref. 26. Río Piedras, April 1937). "Adults were taken in large numbers from light-trap collections, yet the larvae were encountered in only one instance: in a pool formed by a spring in heavily shaded woods." It is listed by Lane (1942–141).

Chaobrus festivus Dyar & Knab, as identified by Dr. Robert Matheson, was listed by Don Julio García-Díaz (1938–95), having been collected while making his ecological survey of fresh water insects of Puerto Rico.

Dixa (Dixella) hoffmani, described by J. Lane (Sao Paulo) in "Dixinae e Chaoborinae, Revisao das espécies neotrópicas (Diptera, Culicidae)" (Revista de Entomologia, **13** (1–2): 81–148, fig. 7, pl. 4, ref. 20. Río de Janeiro, 1942), was from larvae collected by Dr. W. A. Hoffman at Pueblo Viejo and Barranquitas, of which one female (type) was reared to adult. This is the species previously reported as doubtfully *Dixa clavulus* Williston, but which Dr. F. W. Edwards later told Dr. Hoffman was not that, but quite distinct and new.

Corethrella brakeleyi (Coquillett), originally described as a *Corethra* from New Jersey, is now considered by Dr. Alan Stone and H. R. Dodge to be, in part, what Dr. G. S. Tulloch (1937–153) lists as *C. appendiculata* Grabham from Mayagüez (many records), Maricao and Dorado. "The larva, although small in size, is an effective predator on first and second-stage *Culex* larvae. It is found in many open country habitats having clean water, in crab holes, and (referring to an undescribed species) in large numbers in the leafbases of bromeliads." *Corethrella (Corethrella) tripunctata,* described by J. Lane (1942–120) from a type collected at

Carolina, Puerto Rico, at an elevation of 100 feet by Miss Clara South Ludlow, is *C. brakeleyi* according to Drs. Harry Pratt and Alan Stone.

Corethrella sp. nov. is what Dr. W. A. Hoffman collected from a tree hole near Guayama and reported under the name *Corethrella appendiculata* Grabham, and was found by Dr. Tulloch in the leaf-bases of bromeliads. As reported in his "Ecological Notes on Mosquitoes associated with Bromeliads" (Jour. Agr. Univ. P. R., **22** (4): 499–501. Río Piedras, March 23, 1939), the water there enclosed is a very acid environment for mosquito larvae, "the range of pH value being 3.8 to 6.6."

Corethra punctipennis Say, listed by Herr von Roeder and Dr. Gundlach, does not occur in Puerto Rico according to Dr. W. A. Hoffman.

Wyeomyia sp., listed by Dr. C. R. Twinn (*in* Curran 1928–10), a single damaged female from Adjuntas, was first reported with (incorrect) species identification *mitchellii* from Jamaica (Theobald) by Dr. W. A. Hoffman: reared from larvae in bomeliad on El Yunque, November 4, 1934. Subsequently collected there and in the Maricao Forest by Dr. G. S. Tulloch (1937-141), the small bluish-green adults with conspicuous white markings on the hind legs, sometimes "attack man, but cannot be considered fierce biters." The bright yellow larvae, with slightly flattened bodies "move about with a gliding motion over the debris in the leaf bases of the bromeliad (*Catopsis berteroniana*). The water in which they live is either slightly or distinctly acid, having a hydrogen ion concentration corresponding to a pH ranging between 4.0 and 6.5. The temperature of the water varies between 68° and 81°F., being lower on the higher points such as Mt. Britton in the Luquillo National Forest and higher at such points as Maricao." Drs. A. Earl Pritchard and Harry D. Pratt, in presenting their "List of the Mosquitoes of Puerto Rico" (Public Health Reports, **59** (7): 232–3, ref. 6. Washington, D. C., February 18, 1944) consider that the local records represent "a new species."

Anopheles (Nyssorhynchus) albimanus Wiedemann, the most common vector of malaria in the costal lowlands of Puerto Rico, is characterized by "the black and white spotted wings, a broad white band on the hind tarsus, and black and white banded palpi in the female." It was first listed by Herr von Roeder and Dr. Gundlach, and by Dr. L. O. Howard, H. G. Dyar and Fred. Knab in their monumental work on the "Mosquitoes of North and Central America and the West Indies" (**4**: 524–1064. Washington, D. C., 1917) on page 984. In "A Study of Mosquitoes in San Juan, Porto Rico" (Circ. No. 14, P. R. Agr. Expt. Station, pp. 23. Mayagüez, 1912), Mr. W. V. Tower recorded its abundance "in rain-water barrels." This is hardly the most common environment for the larvae, for Dr. F. M. Root in his "Notes on Mosquitoes and other Blood-sucking Flies from Porto Rico" (Amer. Jour. Hygiene, **2** (4): 394–405, fig. 5. Baltimore,

July 1922) found them "in many different kinds of pools, swamps, irrigation ditches, etc., often unshaded, but usually with some aquatic vegetation, more abundant near the coast and lagoons than a few miles inland. Adults attack man readily in the evening." As a result of his "Malaria Surveys in Porto Rico" (P. R. Health Review, **1** (4): 12–18. San Juan, October 1925), Dr. W. C. Earle was convinced that this species was locally "the most important vector of malaria." Dr. H. W. Kumm, recording "The Geographic Distribution of Malaria-carrying Mosquitoes" (Amer. Jour. Hygiene, Monographic Series No. 10, Baltimore, 1929), listed collections at Salinas, Aguirre, Guayama, Fajardo, Caguas, Río Piedras, Sunoco, Cataño and San Germán, and Dr. W. C. Earle in his further study on "Malaria in Porto Rico" (Amer. Jour. Tropical Medicine, **10** (3): 207–230, ref. 8. Baltimore, 1930) records its distribution "throughout most of the island." Dr. Earle's more recent studies are"Notes on the Life-History of *Anopheles albimanus* and *grabhamii*" (P. R. Jour. Public Health and Tropical Medicine, **7** (3): 381–4. San Juan, December 1931), and a year later in the same Journal (**8** (3): 227–242), "Some Observations of Anti-mosquito Screening and Screening Methods." His conclusions on "Malaria in Porto Rico in its Relation to the Cultivation of Sugar Cane" (Southern Medical Journal, **23** (5): 449–452. Birmingham, May 1930) are that it is quite possible to grow sugar-cane under irrigation without increasing the malaria prevalence if adequate drainage is provided, as is shown by "The Relation between Breeding Areas, *Anopheles albimanus* density, and Malaria in Salinas, Puerto Rico" (Southern Medical Journal, **30** (9): 946–950. Birmingham, 1937). Indeed, "it was necessary to bring practically all of this enormous breeding area under control before the mosquito density was definitely reduced. The malaria prevalence was not affected until this mosquito density was brought down and maintained at an extremely low figure." With Dr. H. H. Howard as junior author, Dr. Earle's final contribution to local studies is "The Determination of *Anopheles* Mosquito Prevalence" (Bol. Asn. Medica de P. R., **28**: 233–240. San Juan, 1936).

The very extensive collection records of Dr. G. S. Tulloch (1937–152) include at their extremes Cartagena Lagoon and Las Marías. He notes that the larvae "appear to breed with equal ease in brackish and fresh water, as they were taken in water having 950 parts of chlorine per 100,000 parts of water. The adults are active only at night; during the day they remain in hiding and consequently little is known of their diurnal activities." Indeed, it is a "wild" mosquito, "which feeds on humans during twilight or at night and seldom remains inside houses for more than a few hours," according to Drs. Porter A. Stephens and Harry D. Pratt in their report on the first year's "Work with Residual DDT Spray in Puerto Rico"

(Science, **105** (2715): 32–33. Baltimore, January 10, 1947). By spraying the interior of all the houses in Humacao Playa with DDT three times during the year, "there was a progressive decrease in percentage of positive malaria" of the inhabitants from 5.8 percent to 0.91 percent a year later, as compared with little change in the check of Loíza Aldea, a comparable community in which none of the houses was sprayed with DDT. This mosquito has not been found on Mona Island, but Drs. Pritchard and Pratt (1944–233) collected it on Vieques Island, as well as at every military camp in Puerto Rico. They noted in "A Comparison of Light Trap and Animal Bait Trap Anopheline Mosquito Collections in Puerto Rico" (Public Health Reports, **59** (7): 221–232, fig. 7. Washington, D. C., February 18, 1944) that both sexes are attracted to the light trap, and even for the collection of females, the light trap is generally superior, especially during the dark phase of the lunar cycle.

In the "Relation of Plants to Malaria Control in Puerto Rico" (Supplement No. 200 to the Public Health Reports, pp. 38, fig. 10, ref. 11. Washington, D. C., December 1947), Dr. Harry D. Pratt shows how the role of plants, even those growing on dry land, is complicated by rainfall, and how sand bar formation at the mouth of rivers emptying into the ocean affects the breeding of *Anopheles albimanus*. In his "Studies on the Comparative Attractiveness of 25-, 50- and 100-watt Bulbs for Puerto Rican *Anopheles*" (Mosquito News, **4** (1): 17–18. Albany, N. Y., 1944), he showed that "the traps attracted *albimanus* in numbers which were approximately proportional to the wattage of the three bulbs." He also found that the "Influence of the Moon on Light Trap Collections of *Anopheles albimanus* in Puerto Rico" (Journal of the National Malaria Society, **7** (3): 212–220, fig. 6, ref. 8. Baltimore, September 1948) was so marked that "an index of 1 to 5 *albimanus* per light trap per night during the 'bright phase' " was the equivalent of 5 to 20 mosquitoes during the dark phase of the moon.

Intensive studies were initiated (1948–49) and summarily terminated by Dr. John W. H. Rehn, Chief of Party for the Columbia University Malaria Mosquito Field Research Project, as to its host preferences, night resting and feeding, daytime resting, and the possibility of the aestivation of immature stages. These lacunae were apparent when Dr. J. M. Henderson spoke "On the Possibility of Eradicating the Malaria Mosquito in Puerto Rico" (Bol. Asn. Medica de P. R., **39** (3): 89–96. San Juan, March 1947) and proposed "The Eradication of *Anopheles albimanus* in Puerto Rico—An Ecological Discussion" (Mosquito News, **8** (2): 45–49 and **8** (3): 97–101. Albany, N. Y., June and September 1948).

Anopheles (Anopheles) grabhamii Theobald is first recorded from Puerto Rico by Howard, Dyar & Knab (1917–1009). Mr. W. V. Tower (1921–6) notes that its "legs are very long; the last ankle segment is white

and there is a black band next to the claw." This is hardly the most distinguishing characteristic of this yellowish-brown *Anopheles*, but rather "the almost circular black scales on the wings," as pointed out by Dr. Harry D. Pratt. Indeed, due to his studies, it is now possible to be certain of "The Identification of the First Stage Larvae of Puerto Rican *Anopheles*" (Public Health Reports, **58** (47): 1715–7, fig. 1. Washington, D. C., November 19, 1943), *grabhamii* having "subantennal hair with branches on only one side of a slender central shaft." Dr. F. M. Root (1922-395) noted it "throughout the coastal plain, but in smaller numbers than *A. albimanus*; breeding places much more local and difficult to find, all well shaded, with considerable aquatic vegetation." Dr. G. S. Tulloch (1937–153) found it breeding in brackish water, in which may be included his record of *A.* (*A.*) *crucians* (Wiedemann): a single larva in the brackish water of a hoof print near Guánica Lagoon. Dr. W. C. Earle thought "*Anopheles grabhamii* (Theobald) a possible Vector of Malaria" (Bol. Assn. Med. P. R., **28**: 228–232. San Juan, 1936) of minor importance due to its comparative indifference to humans. Drs. Pritchard and Pratt (1944–233) found it on Vieques Island (where it had previously been collected by Dr. W. A. Hoffman), and at all but one of the military camps in Puerto Rico, noting that "because of its more restricted breeding habitats, this species is more local in its distribution."

Anopheles (Anopheles) vestitipennis Dyar & Knab was first reported from Puerto Rico by Dr. Harrison G. Dyar in describing "The Male of *Anopheles vestitipennis* Dyar & Knab (Diptera: Culicidae)" (Insecutor Inscitiae Menstruus, **12** (10): 171. Washington, D. C., 1924), based on collections made by Dr. H. A. Johnson. This is the largest of the Puerto Rican *Anopheles*, according to Dr. Harry D. Pratt. It is generally blacker in color, with black and white wing scales irregularly scattered over the entire wing. The blackish legs have many small whitish dots or bands. Drs. Pritchard and Pratt (1944–230) note the scarcity of males vs. females, and of both sexes vs. those of other Anophelines. The first record of a larva: in a ditch in a cane field at Barceloneta, is by Dr. H. A. Johnson, "Occurrence of *Anopheles vestitipennis* in Porto Rico" (Amer. Jour. Tropical Medicine, **6** (2): 153–5. Baltimore, March 1926). That of all species is included by Dr. W. H. W. Komp in "The Anopheline Mosquitoes of the Caribbean Region" (National Institute of Health Bulletin No. 179, pp. 1–195. Washington, D. C., 1942). Dr. W. C. Earle (1925–12 and 1930–214) found it quite abundant at certain seasons (October to January) along the coast. It has not been found to date on Vieques Island.

Toxorhynchites (Toxorhynchites) portoricensis, described as a *Megarhinus* by Herr Victor von Roeder (1885-337) from material collected by Dr. Gundlach, is restricted in its larval environment to tree-holes, as noted

by Dr. Root (1922–395), and the leaf bases of bromeliads, according to Dr. Tulloch (1937-151). Mr. W. V. Tower in 1927 found larvae in a tin can, and Dr. W. A. Hoffman collected them in a treehole near Guayama, and reared them to adult. Distribution is from sea-level, at Mayagüez, to an elevation of 2,000 feet at Maricao, where Dr. Tulloch (1939–500) made his only collection in a bromeliad.

Uranotaenia cooki Root, originally described from Port-au-Prince, Haiti, where adults were found by Capt. C. C. Cook resting on the under surfaces of jetting ledges of rocks over pools in the intermittent stream back of Rue Turgeau, was first found in Puerto Rico by Capt. T. H. G. Aitken, with Dr. Harry D. Pratt, as noted by the latter in his discussion of "The Genus *Uranotaenia* Lynch Arribalzaga in Puerto Rico" (Annals Ent. Soc. America, **39** (4): 576–84, fig. 9., ref. 14. Columbus, December 1946). This was also reported by Lt. Com. Albert A. Weathersbee in "A Note on the Mosquito Distribution Records of Puerto Rico and of the Virgin Islands" (P. R. Jour. Public Health and Tropical Medicine, **19** (4): 643–5. San Juan, June 1944), who subsequently had found the larvae "in a marsh among a thick growth of *Typha* in eastern Puerto Rico" at Ensenada Honda. They have since been found in water densely shaded by water hyacinth (*Piaropus crassipes*) at Salinas, and at Ponce, Humacao, Loíza and various north coast points. They are characterized by having a golden-brown head.

Uranotaenia lowii Theobald, whose larvae almost always have a black head, was first noted in Puerto Rico by Dr. F. M. Root (1922–397) "in grassy, meadow pools kept filled for some time by frequent rains, as at Río Piedras." Dr. Tulloch (1937–151) found it in "open country situations" from Rincón to Cartagena Lagoon and Guánica. Dr. Pratt (1946–582) notes it as being "one of the commonest mosquitoes in light trap collection in Puerto Rico, 500 to 1000 specimens of both sexes sometimes being collected in a single, overnight catch, especially during the rainy season," at north coast localities and on Vieques Island.

Uranotaenia sapphirina (Osten Sacken), first recorded from Puerto Rico by Dr. F. M. Root (1922–397) as *U. socialis* Theobald, from "a small swampy ditch containing *Spirogyra* in a young cane field near Río Piedras," was found by Dr. Tulloch (1937–151) in small numbers at Cabo Rojo and Mayagüez. According to Dr. Pratt (1946–583), it "occurs over most of Puerto Rico throughout the year" and on Vieques Island.

Orthopodomyia signifera (Coquillett) was collected by Lt. Com. Albert A. Weathersbee (1944–643) in the Caribbean National Forest at an elevation of 2,300 feet.

Psorophora (**Janthinosoma**) **confinnis** (Lynch Arribalzaga) was found on Vieques Island by Lt. Com. A. A. Weathersbee (1944–644), and re-

ported from Vieques and from five localities in Puerto Rico by Drs. Pritchard & Pratt (1944–233). Under the name *Psorophora jamaicensis* Theobald, this mosquito was first reported from Puerto Rico by Howard, Dyar & Knab (1917–581) from a collection made at Bayamón in 1899 by Mr. August Busck, and Dr. F. M. Root (1922–399) found "larvae in temporary rain pools at Río Piedras, and in a recently flooded irrigation ditch at Aguirre." Dr. G. S. Tulloch (1937–143) collected them only at Mayagüez, especially along the seacost, noting that "the adults are large and vicious biters."

Psorophora (Janthinosoma) johnstonii (Grabham), originally described from Jamaica, was reported from Culebrita and Ponce, Puerto Rico by Dr. Harry D. Pratt in his description of "The Larva of *Psorophora* (*Janthinosoma*) *coffini* Dyar and Knab and a Key to the *Psorophora* Larvae of the United States and the Greater Antilles" (Proc. Ent. Soc. Washington, **48** (8): 209–14, fig. 1, ref. 5. Washington, D. C., November 1, 1946).

Psorophora (Janthinosoma) pygmaea Theobald, first reported from Puerto Rico by Dr. G. S. Tulloch (1937–142): at Mayagüez and at many points on the south coast, is a large, well-marked mosquito which bites human beings during the day as well as at night. "The larvae are large, have inflated air tubes, and prefer to live in temporary fresh water ground pools containing little or no vegetation. They are able to develop in brackish water, for at Lake Guánica they were found in hooftrack pools containing 665 parts of chlorine per 100,000 parts of water." Distribution is by no means confined to the south coast, for Drs. Pritchard and Pratt found this species at Borinquen Field (north of Aguadilla) and at Fort Buchanan (west of San Juan), and Lt. Com. Weathersbee (1944–644) on Vieques Island. Both this and the preceeding species, and also such typical salt marsh mosquitoes as *Aedes taeniorhynchus* and *Aedes sollicitans*, have been noted by Dr. Harry D. Pratt (1947–9) to develop in enormous numbers in the flats of pickleweed (*Batis maritima*) after heavy rainfall. "The eggs of these salt marsh mosquitoes are laid on the damp soil. As the land becomes dry, the embryos develop inside the eggs, and they are ready to hatch with the next rainfall. If the water stands on such places for 4 or 5 days, production of (these four species) may be tremendous."

Mansonia (Mansonia) indubitans Dyar & Shannon was first collected in Puerto Rico by Dr. G. S. Tulloch (1937–146) at Sabana Grande and at Cartagena Lagoon, the larvae "attached to the submerged stems of *Pistia stratiotes*," locally known as "lechuguilla de agua," being reared to adult, described and figured. Drs. Pritchard & Pratt (1944–233) found this species at Tortuguero Lagoon, and at Fort Buchanan. The record of *Taeniorhynchus perturbans* Walker from Puerto Rico, by Dr. L. O. Howard

in his "Notes on the Mosquitoes of the United States" (Bulletin No. 25, new series, Div. Ent., pp. 70. Washington, D. C., 1900), may refer to this species, or to the following.

Mansonia (Mansonia) flaveolus (Coquillett), originally described as a *Taeniorhynchus* from the Island of St. Thomas, the type having been collected by Mr. Aug. Busck, occurs in Puerto Rico, the larvae and pupae having been found at Carolina on the roots of water spoon (*Hydromystria stolonifera*), as reported by Dr. Harry D. Pratt in discussing "*Mansonia indubitans* Dyar & Shannon—a New Mosquito Addition to the United States Fauna" (Journal Kansas Ent. Soc., **18** (4): 121–9, fig. 14, ref. 6. Manhattan, October 1945). The adult female of *flaveolus* is definitely yellowish or golden in color, and has palpi more than half the length of the proboscis. Indeed, to this species should be referred all records of *Mansonia* (*Mansonia*) *titillans* (Walker), as identified by Dr. Alan Stone, which was intercepted at Mayagüez by Mr. A. G. Harley, and reported by Dr. Tulloch (1937–146). It is not rare, having been collected by Drs. Pritchard & Pratt at Laguna Tortuguero, at Gurabo and Carolina, at Borinquen Field (north of Aguadilla), Fort Buchanan (west of San Juan), and also on Vieques Island.

Aedes (Stegomyia) aegypti (Linnaeus), described from the West Indies by Fabricius as *Culex fasciatus*, and thus first listed from Puerto Rico by Herr C. Moritz (1836–377) as the only identified species, and subsequently by Dr. Gundlach, is given in Van Zwaluwenburg's list as *Aedes* (*Stegomyia*) *calopus* Meigen, and when mentioned by Mr. W. V. Tower (1908–38, 1912–6 and 1921–5). This is the yellow fever mosquito, noted by Dr. F. M. Root (1922–397) as "very common in and around houses, everywhere swarming in artificial containers around houses," and ever ready to serve as a vector of the disease if any person or animal infected with yellow fever arrives in the regions where it does not now exist. Dr. C. R. Twinn (*in* Curran 1928–10) records it from Mona Island, and it is still a common species there despite the scarcity of people to bite and of artificial containers of water. Dr. W. A. Hoffman collected it on Vieques Island in December 1937, and Dr. G. S. Tulloch (1937–145) has records from "all parts of the coastal plains of Puerto Rico and in many of the towns high in the mountains. The adults are fierce biters and attack freely and without warning during the day and early in the evening." Apparently adults are little attracted to light traps, for Drs. Pritchard and Pratt found it only at Ponce. Physiologically, this mosquito has been intensively studied by Dr. E. B. McKinley, who described "The Salivary Gland Poison of *Aedes aegyptii*" (Proc. Soc. Expt. Biol. & Medicine, **26** (9): 806–9. New York, June 1929), and Dr. R. Kudo describes in his "Studies on Microsporidia

parasitic in Mosquitoes viii. On a Microsporidian, *Nosema aedis* nov. spec., parasitic in a larva of *Aedes argenteus* (*aegyptii*) of Puerto Rico" (Archiv. Protistenk. **49** (1): 23–28, pl. 2, ref. 47. Jena, January 15, 1930).

Aedes (Finlaya) mediovittatus (Coquillett) is first recorded from Puerto Rico by Mr. W. V. Tower (1908–38 and 1912–6), who collected larvae at Mayagüez in hollow tree trunks, tin cans and bamboo pots. Dr. C. R. Twinn (*in* Curran 1928–10) lists a single female from Naguabo, Drs. Pritchard and Pratt (1944–233) found it only at Carolina, but Dr. W. A. Hoffman reared it from larvae in tree holes and bamboo thickets at Yauco, Guayama, Toa Alta, Sabana Llana and Pueblo Viejo. Dr. G. S. Tulloch (1937–145) adds no new locality records. Lt. Com. Weathersbee (1944-644) records it from Vieques Island.

Aedes (Taeniorhynchus) sollicitans (Walker), the common bronze or golden-brown migrating salt marsh mosquito of the Atlantic coast, was first collected in Puerto Rico by Dr. W. A. Hoffman at San Juan in October 1930, his identification being confirmed by Dr. F. M. Root. Drs. Pritchard and Pratt (1944–233) made light trap collections at Fort Buchanan (west of San Juan), and also on the south coast, where Dr. G. S. Tulloch (1937-143) had found it most abundant: at Guayama, Aguirre and Guánica, larvae occurring in brackish pools adjacent to Guánica Lagoon. Lt. Com. Weathersbee (1944–644) records collecting it on Vieques Island.

Aedes (Taeniorhynchus) taeniorhynchus (Wiedemann), a small black and white salt marsh mosquito, common on both the Pacific and Atlantic coasts of the United States, was re-described as *Culex portoricensis*, the type from Puerto Rico, by Miss C. S. Ludlow (Canadian Entomologist, **39**: 386. London, Ontario, 1905). Dr. F. M. Root (1922–397) used the name *Aedes* (*Taeniorhynchus*) *portoricensis* for the larvae, which he found in temporary rain pools near large lagoons at Río Piedras and Aguirre, the adults biting man by day. Dr. W. A. Hoffman made repeated collections at Dorado and San Juan, and Dr. G. S. Tulloch (1937-144) found it at Mayagüez and Guánica, the larvae "in clean, dirty, fresh and brackish pools." Drs. Pritchard and Pratt (1944–233) found it attracted to light traps on Vieques Island, and at Losey Field (south of Juana Díaz), at Tortuguero Lagoon, and at other points on the north coast.

Aedes (Ochlerotatus) tortilis (Theobald) was first collected in Puerto Rico by Dr. G. S. Tulloch (1937–143) at Las Mesas, near Mayagüez, at an elevation of 1,000 feet, and subsequently on Maricao mountain at an elevation of 3,000 feet. Dr. Tulloch's "records for *Aedes nubilus*, *A. condolescens* and *A. scapularis* are based on material which probably was" this species, according to Drs. Pritchard & Pratt (1944–232), who made light trap collections at five widely separated localities in Puerto Rico.

Culex (Micraedes) americanus (Neveu-Lemaire) larvae were found

by Dr. G. S. Tulloch (1937–148 and 1939–500) in the water in the leaf bases of bromeliads, malangas and "rábano cimarrón" (*Dieffenbachia seguine*), with a pH of 3.8 to 6, only at the higher elevations: at Maricao and on El Yunque. He assumes that the adults do not attack warm-blooded animals. It was first reported from Puerto Rico by Mr. W. V. Tower (1908–38 and 1912–6) as *Culex bisulcatus* Coquillett, reared from larvae in an old pail at Mayagüez. In synonymy with *americanus*, according to Dr. Alan Stone and Colonel W. H. W. Komp, is also **Culex antillum-magnorum** Dyar, as determined by Dr. F. M. Root, which Dr. W. A. Hoffman found in the water in bromeliads at Jájome Alto and on El Yunque. Presumably at El Yunque Don Julio García-Diaz (1938–95) collected the material which was determined as this species by Dr. Robert Matheson.

Culex (Melanoconion) atratus Theobald was first recorded from Puerto Rico by Dr. F. M. Root (1922–400), who reared "a single male from a pupa collected in a semipermanent roadside swamp at Martín Peña", and identified other adults reared by Dr. W. A. Hoffman on Monteflores Hill, Santurce, and in cattail swamp and small lake at Sardinera, Dorado. Dr. G. S. Tulloch (1937–148) found larvae at Mayagüez, and Drs. Pritchard and Pratt (1944–233) collected adults at light traps near San Juan, at Laguna Tortuguero, and on the south coast at Losey Field, south of Juana Díaz.

Culex (Culex) bahamensis Dyar & Knab was first collected by Dr. W. A. Hoffman as larvae in the turbid outlet of a small lake at Sardinera, Dorado August 15, 1930, his identification of the adults being confirmed by Dr. F. M. Root. Dr. G. S. Tulloch (1937–149) noted larvae so abundant in brackish water near Salinas that it appeared black, and also found them in hoof-track pools around Guánica Lagoon. In light traps, Drs. Pritchard and Pratt (1944–233) collected adults at Ensenada Honda, and on Vieques Island, where Lt. Com. Weathersbee (1944–644) also found them.

Culex (Melanoconion) erraticus Dyar & Knab was redescribed from Puerto Rico by Dr. F. M. Root (1922–400 to 405, fig. 3) as *Culex (Choerophora) borinqueni*, "the commonest 'wild' Culex in the Porto Rican coastal plain, found breeding in all sorts of ditches, slow streams, pools and marshy places," as at Río Piedras, Martín Peña and Aguirre, but subsequently identified as *Culex inhibitator* Dyar & Knab the specimens collected by Dr. W. A. Hoffman at Dorado. Under the latter name, Dr. G. S. Tulloch (1937–147) records numerous collections from the west coast. Dr. W. V. King and G. H. Bradley in "Notes on *Culex erraticus* and related Species in the United States (Diptera, Culicidae)" (Ann. Ent. Soc. America, **30** (2): 345–57, illus. Columbus, June 1937) indicate the synonymy under which Drs. Pritchard and Pratt (1944–233) record their collections at

light traps at Tortuguero Lagoon, at Fort Buchanan (west of San Juan) and at Losey Field (south of Juana Díaz). Lt. Com. Weathersbee (1944-644) collected this mosquito on Vieques Island.

Culex (Culex) chidesteri Dyar larvae are reported by Dr. H. D. Pratt (1946–581) in a reservoir at Salinas.

Culex (Culex) habilitator Dyar & Knab, first identified from Puerto Rico by Dr. F. M. Root from material collected by Dr. W. A. Hoffman at Dorado in a stagnant ditch, October 1, 1930, was found by Dr. G. A. Tulloch (1937–149) breeding in brackish water at Guánica Lagoon, in brackish pools near the Añasco River and in swampy fresh-water areas in Mayagüez. Lt. Com. Weathersbee (1944–644) and Drs. Pritchard and Pratt (1944–233) record it from Vieques Island, the latter collecting adults by light trap at six points in Puerto Rico.

Culex (Culex) janitor Theobald is "known only from adults collected in the mouths of crab holes" according to Dr. G. S. Tulloch (1937–150), who records collections by himself at Mayagüez and Dorado, and by Dr. W. A. Hoffman at Pueblo Viejo.

Culex (Culex) nigripalpus Theobald, first recorded from Puerto Rico by Mr. W. V. Tower (1912–6) as *Culex similis* Theobald, was found by Dr. F. M. Root (1922–399) as larvae "in small numbers in temporary meadow pools at Río Piedras, and in enormous numbers in a ditch highly polluted with sewage at Fajardo." Dr. Root also identified for Dr. Hoffman material from a small pond at Dorado. It has been intercepted at San Juan and at Mayagüez, Dr. G. S. Tulloch (1937–149) noting that it "is probably the most abundant of all tropical forms of *Culex*," listing many collection records from the western end of the Island. Listed from Vieques Island by Lt. Com. Weathersbee (1944–644) and by Drs. Pritchard & Pratt (1944–233), it was collected by the latter from light traps at six points in Puerto Rico.

Culex (Melanoconion) opisthopus Komp, as reported by Drs. Harry D. Pratt, W. W. Wirth and D. G. Denning in their paper on "The Occurrence of *Culex opisthopus* Komp in Puerto Rico and Florida, with a Description of the Larva (Diptera: Culicidae)" (Proc. Ent. Soc. Washington, **47** (8): 245–51, pl. 2, ref. 3. Washington, D. C., November 1945), is known to occur from Cataño to Ensenada Honda: the larvae in sluggish streams with rank vegetation, or pools alongside in dense shade, and the adults attracted to both horse and light traps. It is the only Puerto Rican *Culex* having the last segment of the hind tarsus entirely white, according to Dr. Pratt.

Culex (Melanoconion) pilosus Dyar & Knab larvae were found at Mayagüez by Dr. G. S. Tulloch (1937–147) in a roadside ditch, resting "on their backs on the bottom of the pool, and when disturbed, exhibiting a peculiar

wiggling motion of the hinder parts of the body which is different from that of any other tropical *Culex* encountered." Adults were taken in light traps at Laguna Tortuguero and at Fort Buchanan (west of San Juan) by Drs. Pritchard & Pratt (1944–233).

Culex (Culex) quinquefasciatus Say, first recorded for Puerto Rico by Dr. Augustin Stahl as *Culex pipiens* L., was listed by Mr. W. V. Tower (1908–38) as *Culex cubensis* Bigot, and under the present name by Howard, Dyar & Knab (1917–237): the specimens collected by Mr. Tower at Mayagüez, those from Guayama by R. A. Pearson, and those from Vieques Island by C. C. Craft. Lt. Com. Weathersbee (1944–644) also found it on Vieques, as did also Dr. W. A. Hoffman in 1937, but the first record from Mona Island is by Prof. J. A. Ramos (1947–55) who found it "extremely abundant and troublesome at Sardinera beach, April 4–7, 1944." In Mr. W. V. Tower's later papers (1912–6 and 1921–5), he calls it "the common house mosquito of the tropics" and gives notes on its habits. As *Culex fatigans* Wiedemann Dr. F. M. Root (1922–399) noted it "common everywhere in the coastal plain, breeding in all sorts of artificial containers and biting man readily in the evening," having collected it at Ponce, Aguirre, Río Piedras and Quebradillas. Dr. C. R. Twinn (*in* Curran 1928–10) found that most of the mosquitoes submitted for his examination from Puerto Rico were "this common household mosquito of the tropics."

Dr. W. A. Hoffman reporting, with R. A. Marín and A. M. B. Burke, on "Filariasis in Porto Rico" (P. R. Journal Public Health & Tropical Medicine, **4** (3): 120–7, map. San Juan, March 1928) found it in all localities examined, but scarcer at the higher altitudes, and for "Insectae Borinquenses" (1936–331) wrote: "apparently well distributed throughout the Island, being encountered at such high altitudes as Maricao and above Aibonito in great numbers. It prefers polluted water and breeds in latrines and septic tanks." Dr. G. S. Tulloch (1937–150) records many collections, and that the larvae "are able to develop in clear water or in water heavily laden with sewage. The adults enter houses in great numbers in search of blood, and from the standpoint of annoyance it is most important. It is probably the only vector of filariasis in Puerto Rico." The collections at light trap reported by Drs. Pritchard & Pratt (1944–233) are from the north coast and the interior of the Island, and from Losey Field on the south coast. The effectiveness of spraying with DDT for its control was shown at the Isabela cotton ginnery, where this was the only mosquito found with the other dead insects on the floor and window-sills, and earlier, when Dr. Harry D. Pratt sprayed the basement of the main building of Experiment Station at Río Piedras, May 20, 1944, full of adults coming from stagnant pools in the dried-up and polluted river nearby.

Culex (Culex) secutor Theobald, re-described as the new species *Culex*

toweri by Dr. Harrison G. Dyar & Fred Knab in their "Descriptions of some American Mosquitoes" (Jour. N. Y. Ent. Soc., **15** (1): 13. New York, March 1907) from Puerto Rico, is reported by its collector, Mr. W. V. Tower (1912–6), as reared from larvae in bamboo pots at Mayagüez, but earlier (1908–38) both under this name and as *Culex salinarius* Coquillett. Dr. W. A. Hoffman collected it at Jájome Alto, June 18, 1930, as determined by Dr. F. M. Root, and Dr. G. S. Tulloch (1937–150) found larvae only in deeply shaded pools in the lowlands: at Mayagüez, and in permanent pools at high altitudes in the Luquillo and Maricao Forests.

Deinocerites cancer Theobald, the crab-hole mosquito of the West Indies, was first reported from Puerto Rico by Dr. F. M. Root (1922–405), who thought it "probably found throughout the coastal plain near the ocean and the lagoons, where crab-holes occur. Adults or larvae were collected at Martín Peña, Río Piedras and Aguirre," and at Dorado by Dr. W. A. Hoffman. Dr. G. S. Tulloch (1937–147) made collections at Mayagüez, and Drs. Pritchard & Pratt (1944–233) at light traps at four points in Puerto Rico as well as on Vieques Island, where Lt. Com. Weathersbee (1944–644) also found it.

Fungivoridae (Mycetophilidae): Fungus Gnats

Fungivora merdigera, described by Messrs. F. Knab and R. H. Van Zwaluwenburg as "A second *Myceptophila* with Dung-Bearing Larva (Diptera: Mycetophilidae)" (Entomological News, **29** (4): 138–142, pl. 1. Philadelphia, April 1918), the type from Aibonito, was subsequently reared from larvae on "pomarrosa" (*Eugenia jambos*) at Mayagüez, and from the type locality on "guamá" (*Inga laurina*) by Dr. Richard T. Cotton. Mycetophilids with "dung-capped larvae are rare," according to Mr. Knab, "the only other known being from the Amazon rain forests."

Fungivora insipiens (Williston), determined as a *Mycetophila* by Dr. Alan Stone, originally described from St. Vincent, was intercepted by Mr. R. G. Oakley resting on *Inga vera* at Jayuya.

Leia mutchleri, described by Dr. C. H. Curran (1928–14) from a type male from Adjuntas, is "black above; wings with two brown fasciae; length 4.25 mm." Specimens intercepted at Añasco have been identified as a species of *Leia*, presumably not this.

Boletina incompleta, described by Dr. C. H. Curran (1928–13) from a type female at Adjuntas, has clear wings, and is "pale rusty yellow, the abdomen mostly black; length 3.5 mm."

Lycoria tritici (Coquillett), as identified by Dr. Alan Stone, was reared from larvae in cachaza in soil around begonia seedlings being grown by Mr. Miguel A. Díaz at Río Piedras. Both sexes were present, for the adults were often in coitu, occurring in large numbers, but the maggots seemed to

cause no injury to the tender plants. This is a common continental gnat, of some economic importance, found in greenhouses and outdoors in tobacco seedbeds, and in wheatfields, the larvae feeding on the roots and mining in the stems.

Lycoria hartii (Johannsen), determined as a *Sciara* by Dr. O. A. Johannsen in 1932, was reared from earth in a can in which larvae of *Diaprepes abbreviatus* larvae were being fed on sprouting corn, at Isabela.

Numerous additional species of *Sciara* (or *Lycoria*) are known to be present in Puerto Rico, but lacking accompanying males, specific identification is impossible. Most annoying are the great numbers of stinking black midges that, at about monthly intervals, are attracted to lights for two or three nights during the winter months in the northwestern corner of the Island. They do not fly as high as the second story of houses, but so many may come to electric lights of one story houses, and die on the food on the dining table that it becomes inedible before it can be removed. These gnats do not bite, and indeed they do not ordinarily get on people, but the odor of only a few is so powerful that when they come in large numbers one can only turn out the light and leave the world to them. All are females and neither Dr. O. A. Johannsen nor Miss Elizabeth G. Fisher could identify them as to species. They are so small as to be able to penetrate the mesh of any ordinary mosquito bar, so that one can not even read in bed after dark at the time when they are abundant.

Another species of *Sciara* (or *Lycoria*) has been reared by Mr. Thos. H. Jones from maggots in a cottony substance secreted by mealybugs on sugar-cane; Mr. A. G. Harley at Mayagüez reared others from chayote (*Sechium edule*), and adults of another species have been repeatedly collected from the leaves of corn plants.

Itonididae (Cecidomyiidae): Gall Midges

Asphondylia rochae Tavares, as determined by Dr. E. Porter Felt, was found by Prof. James G. Needham (1941–3) to be causing galls in the seed pods of *Jussiaea angustifolia*, and to be parasitized by *Rileya megastigma* Ashmead and *Callimome montserrati* Crawford.

Asynapta citrinae was described by Dr. E. Porter Felt: "A New Citrus Cambium Miner from Puerto Rico" (Jour. Dept. Agr. P. R., **16** (2): 117–8. San Juan, July 1922). The yellowish white larvae, 3.0 mm. in length when fully grown, injure grapefruit twigs in a manner similar to the West Indian *Asynapta mangifera* Felt larvae do the small twigs of grafted mango. The adults are 1.75 mm. long, pale yellow in color, with black eyes.

Arthrocnodax constricta was described by Dr. E. Porter Felt (Jour. Ec. Ent., **7** (6): 481. Concord, December 1941) from material "reared from garden beans infested with the common red spider, *Tetranychus bimaculatus*,

and probably predaceous thereupon, by Mr. Thomas H. Jones, June 21, 1913 at Río Piedras." The male is 1.0 mm. long, the female, 1.25 mm.; yellowish or yellowish-brown midges, with antennae as long as the body.

Arthrocnodax macrofila Felt, as determined by Dr. E. Porter Felt, was found on mite-infested cattle feed at Río Piedras, presumably preying upon the mites in the feed, "since that is a somewhat common habit for several species of this genus."

Karschomyia cocci, described by Dr. E. Porter Felt (Canadian Entomologist, **45** (9): 304–5. London, 1931) from material reared by Mr. Thos. H. Jones from the pink mealybug of sugar-cane, *Trionymus sacchari* (Cockerell), collected at Patillas, has repeatedly been reared from this host, and Mr. E. G. Smyth (192)–124) reared what he thought to be this species from another mealybug, *Pseudococcus virgatus* (Cockerell), on cotton. "The adults display the strange habit of hanging in rows festooned on strands of spider-web, where they perform a rocking motion by means of the wings," according to Mr. Smyth's observations.

Mycodiplosis insularis was described by Dr. E. Porter Felt (1913–305) from material reared by Mr. Thos. H. Jones from red spiders, *Caligonus antillarum* Banks, on leaves of "molinillo" (*Leonotis neptaefolia*) and of the common milkweed, *Asclepias curassavica.*

Kalodiplosis multifila Felt, first collected in Puerto Rico by Mr. August Busck, according to Dr. Felt, was subsequently identified by him from material reared by Mr. Francisco Seín from *Pseudococcus citri* (Risso) on mulberry.

Dasyneura eugeniae Felt was the tentative identification given by Mr. C. T. Greene of gall midges emerging from a witches' broom formed on a terminal shoot, really a deformed fruit, of crape myrtle (*Lagerstroemia indica*) at Río Piedras.

Itonida coccidarum (Cockerell), originally described as a *Cecidomyia* from Jamaica, was reported by Mr. D. W. Coquillett (1900–240) as found in Puerto Rico by Mr. Aug. Busck: "bred from larvae associated with *Dactylopius citri* and bred from *Lecanium hemisphaericum.*"

Ctenodactylomyia watsoni, described by Dr. E. Porter Felt from midges reared from galls in the leaves of seagrape (*Coccoloba uvifera*) by Prof. J. R. Watson in Florida, is presumably the same insect as that causing the galls of seagrape in Cuba to which Dr. Mel. T. Cook gave the name *Cecidomyia coccolobae.* Typical galls are common on seagrape leaves in Hispaniola and on Mona, the first identification of Puerto Rican material being by Dr. Felt for Mr. R. H. Van Zwaluwenburg at Mayagüez. They occur everywhere in Puerto Rico that seagrape grows, and to a lesser extent inland on some of the other species of *Coccoloba*, but are possibly most abundant at Guajataca, where leaves may be noted with possibly half of the leaf tissue hyper-

trophied by the poisons secreted by the maggots of this midge. From galls at Guajataca, a species of *Eurytoma* (Eurytomidae) and a species of *Telenomus* (Scelionidae), as determined by Mr. A. B. Gahan, have been reared.

Scatopidae

Scatopse pygmaea Loew, a continental March fly, reported also from St. Vincent, was found in Puerto Rico by Mr. Aug. Busck, as listed by Mr. D. W. Coquillett (1900–250). Dr. Wetmore reports one of these flies eaten by a hummingbird.

Bibionidae: March flies

Dilophus spinipes Say, as identified by Dr. Alan Stone, is another continental species found in Puerto Rico, adults having been found resting on the flowers of *Inga laurina* at Cayey. Dr. Wetmore reports a fly of this genus eaten by a hummingbird. Numerous individuals identified by Dr. Alan Stone as a species of *Dilophus* not *spinipes*, were found on flowers of "botoncillo" (*Borreria verticillata*) at Guajataca.

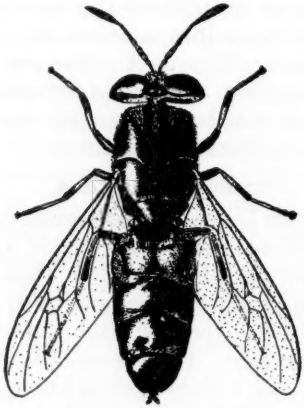
Simuliidae: Blackflies

Simulium haematopotum Malloch, as determined by Mr. J. R. Malloch, previously known from Cuba, Mexico and Central America, was first collected in the low hills back of Río Piedras by Mr. Thos. H. Jones. He noted that "their bite is painful and felt immediately after the fly lights on any exposed portion of the body. Very abundant, and writer was attacked on hands, forearms, neck and face. The flies were persistent, despite a bright sun and slight breeze. Only a slight swelling followed their bites," but he failed to note the small central spot of blood differentiating the lesion resulting from its attack from that caused by punkies. This record was listed by Drs. Harrison G. Dyar and Raymond C. Shannon in "The North American Two-winged Flies of the Family Simuliidae" (Proc. U. S. National Museum, 69 (10): 1–54. Washington, D. C., 1927), but the most extensive account is that by Mr. Schuyler Bradt, working under the direction of Dr. W. A. Hoffman, in his "Notes on Porto Rican Blackflies" (P. R. Journal Public Health and Tropical Medicine, **8** (1): 69–81, fig. 5. San Juan, September 1932). He found that the larvae prefer to attach themselves to vegetation in sluggish streams, and suggests cleaning the streams of vegetation and increasing the rapidity of their rate of flow to make conditions less favorable for their development. He saw them catch and devour mayfly nymphs, and be devoured in turn by the nymphs of dragon flies.

Simulium minusculum Lutz, as identified by Dr. J. M. Aldrich, "described from Brasil, also found in Costa Rica," was found by Mr. Francisco Seín to be abundant only in the spring around Río Piedras.

Simulium quadrivittatum Loew, originally described from Cuba, was first reported from Puerto Rico by Mr. J. R. Malloch in his paper on

"American Black Flies or Buffalo Gnats" (U. S. Dept. Agr., Bureau of Entomology Technical Series No. 26, pp. 83, pl. 6, ref. 26. Washington, D. C., April 6, 1914), on page 61, where collection at Utuado by C. W. Richmond is cited. Dr. Alex. Wetmore notes this blackfly eaten by the tody, and Dr. F. M. Root (1922–396) records his personal reactions to its bite. Presumably this is the more common species in Puerto Rico, being generally called locally "los majes," found usually in the more forested areas, in clearings in the woods, and specifically collected at Río Piedras, Bayamón, Cidra, Corozal, Utuado, Lares and San Sebastián.



The Stratiomyid fly, *Hermetia illucens* (Linnaeus), three times natural size. (Drawn by Fritz Maximilien.)

Stratiomyidae: Soldier flies

Hermetia illucens, described by Linnaeus as a *Musca* from South America, and recorded by Fabricius from the West Indies, has an extended distribution in the neotropics and in the United States as far north as Philadelphia. It is a large black, clear-winged fly, first collected in Puerto Rico by Drs. Stahl and Gundlach and listed by von Roeder. Dr. Gundlach notes: "Se posa muchas veces sobre los troncos de los árboles recién cortados," but less often noted in recent years on recently felled trees, when there are fewer trees to cut down. Sometimes individual flies are attracted to light at night, but normally it is a diurnal fly, not attracted to flowers, and only because it must rest somewhere, coming to rest on any particular wall, leaf, fruit or tree trunk. The larvae are tough, leathery, greyish-brown maggots, flattened and wrinkled at the lateral margins, sometimes to be found in large numbers feeding on decaying vegetation such as moist

paper cartons, well rotted cachaza, rotting grapefruit, or the debris from grapefruit or pineapple canneries. One has been found eaten by the introduced frog, *Rana catesbeiana* Shaw.

Hermetia albitarsis Fabricius, as *Hermetia sexmaculata*, is listed by J. Macquart (Hist. Nat. Dipt., **1**:229. Paris, 1834) from Puerto Rico. Dr. C. H. Curran in his "First Supplement to the 'Diptera of Porto Rico and the Virgin Islands'" (American Museum Novitates No. 456, pp. 23, fig. 4. New York, February 11, 1931) states that "the absence of translucent yellowish or whitish spots on the second abdominal segment will at once distinguish this species from *illucens* Linnaeus," and records collection by Prof. W. T. M. Forbes at Las Cruces. Numerous unspotted adults have been taken at Río Piedras, and one at Guajataca. Mr. Policarpo González found numerous maggots in the dry buds of small dead coconut palms (*Cocos nucifera*) at Arroyo, all of which produced the slender, unspotted adults of this species.

Sargus bicolor was described from Puerto Rico by C. R. W. Wiedemann in his "Aussereuropaische Zweiflugelige Insekten," (**2**: 41. 1830). It was not collected by Drs. Gundlach or Stahl, is not listed by von Roeder, and has not been found since.

Geosargus lucens (Loew), originally described as a *Sargus* from Cuba, was intercepted resting on achiote at Arecibo, as identified by Mr. C. T. Greene.

Macrosargus lateralis (Macquart), originally described as a *Sargus* from Cuba, has been repeatedly intercepted in Puerto Rico, as identified by Mr. C. T. Greene, in grapefruit groves in the metropolitan area, and collected by Mr. S. S. Crossman at Aibonito. This is a slender, iridescent purplish-blue fly of moderate size, its abdomen with whitish pubescent bands.

Neorondania chalybea Wiedemann, originally described from St. Thomas, is a stout blue-black fly, its prothorax striped and its flattened abdomen banded with silvery pubescence, first identified from Puerto Rico by Mr. F. Knab, listed by Mr. R. H. Van Zwaluwenburg (P. R. 1244) from *Spondias lutea*. Adults have repeatedly been noted sucking the juice from overripe jobo fruits on the ground, and from rotting oranges and grapefruit, and Mr. R. G. Oakley intercepted them at Ponce. Dr. Luis F. Martorell noted them in abundance resting on the screens around the kitchen, latrines, and dining room of the camp on Mona Island in 1939. Mr. Thos. H. Jones found the larve "beneath the stinking, flaking bark of dying papaya trees at Río Piedras," and in February 1940, Mr. Anacleto Ramos, gardener of the Experiment Station at Río Piedras, found maggots abundant, feeding on rotten pulp between fibers just under rind of the dead bark of a "yuma" palm, *Cocotrynax argentea*. Another *Neorondania*, not identified as to species by Mr. C. T. Greene, also occurs in Puerto Rico, adults having been

caught in fruit-fly traps, and maggots reared to adult, feeding on rotten banana stem, at Río Piedras.

Eulalia dorsalis (Fabricius), originally described as a *Stratiomys* from the West Indies, presumably St. Thomas, and found also in Santo Domingo, was first reported from Puerto Rico by Mr. D. W. Coquillett (1900–251), having been collected by Mr. August Busck. Dr. C. H. Curran (1928–17) lists specimens from San Juan, and identified for Dr. Stuart T. Danforth many which had been collected at Tortuguero Lagoon, Cartagena Lagoon, and at Mayagüez. Other specimens of an *Odontomyia*, intercepted at Arecibo, have been identified by Mr. C. T. Greene as "near *trivittata*."

Eulalia virgo (Wiedemann) a continental species originally described as a *Stratiomys* from Savannah, Georgia, and later collected at Trenton Falls, New York, was identified by Mr. C. T. Greene from adults found resting on a grapefruit leaf at Barceloneta.

Neurota bicolor (Wiedemann), originally described as a *Sargus* (1830–41) from Puerto Rico, was re-described by Dr. C. H. Curran (1931–2), from specimens from Vieques Island, noting that "Wiedemann states that the color is golden green, but this applies only when the insect is examined without magnification."

Nemotelus monensis, described by Dr. C. H. Curran (1928–16) from a single female from Mona Island, is "metallic greenish black, the front with yellowish white orbital spots below; length 3.0 mm."

Nothomyia calopus Loew, originally described from Cuba, is recorded by Dr. C. H. Curran (1928–16) from Adjuntas, and specimens identified by him have been taken at Mayagüez and Río Piedras.

Pedicella schwarzi, described by Dr. C. H. Curran (1928–16) from a male at Cayey, is a large fly, 12.0 mm. long, the "thorax bright metallic green, the abdomen cupreous-bronzed, the sides with greenish reflections."

Cyphomyia lasiophthalma Williston, originally described from St. Vincent, and by Dr. C. H. Curran (1928–17) recorded from St. Croix, and in Puerto Rico from Cayey, also occurs at many other points, and Dr. Stuart T. Danforth had specimens from Desecheo Island.

Microchrysa flaviventris Wiedemann, as identified by Mr. C. T. Greene, has been intercepted at Yauco by Mr. R. G. Oakley.

Microchrysa polita (Linnaeus), a European and North American species, was intercepted in a grapefruit grove at Garrochales, as determined by Mr. C. T. Greene.

Euryneurasoma slossonae Johnson, as determined by Mr. C. T. Greene, has been intercepted at light at San Juan, and a species of *Spyridopa* on mango blossoms at Mayagüez by Mr. A. G. Harley.

Tabanidae: Horseflies

Chrysops variegata (Degeer), as *Chrysops amazonius* was first reported from Puerto Rico by Camillo Rondani (Arch. Zool. Modena, **3**: 81. 1863), according to Dr. Joseph C. Bequaert, writing on "The Tabinidae of the Antilles (Dipt.)" (Revista de Entomologia, **11** (1–2): 253–369, fig. 23. Río de Janeiro, June 1940). As *Chrysops costatus* F., it was identified for Drs. Stahl and Gundlach by Herr von Roeder, and thus listed by them. Dr. Gundlach notes it as being "muy común en terrenos bajos, donde suele posarse encima de las orejas de los caballos para chupar la sangre por lo cual es insecto muy molesto," and Dr. F. M. Root (1922–405) calls it "mosca de mangle." Dr. H. L. Van Volkenburg (1932–25, 1933–23 and 1935–24) repeatedly mentions it as a pest attacking domestic animals, and indeed it occurs in sufficient abundance around Cartagena Lagoon that Dr. Stuart T. Danforth (1920–112 and 121) found it an item of food for the barn swallow and the prairie warbler, and being chased by the Bembecid wasp, *Stictia signata*. Indeed these wasps are so bold in their attempts to catch horseflies as to pounce on them when biting a mounted horse, and scaring both horse and rider. Dr. F. M. Root (1922–405) observed this horsefly captured in flight by a dragonfly, *Lepthemis vesiculosa* F. All records of occurrence in Puerto Rico are from coastal localities, the larvae presumably developing in the muddy water of mangrove swamps, but the species has an extensive neotropical distribution, having been originally described from Surinam. Rarely the flies attack man on head or arms, being especially annoying in the Seboruco woods around Laguna San José, and in paths thru the woods back of Río Piedras, and around Isabela Grove at Pt. Salinas, but are not nearly so common at present as twenty or thirty years ago. Dr. Bequaert translates the original description of *variegata* as being a "tawny-yellow tabanid, with cylindrical antennae, the thorax and abdomen with longitudinal brown stripes; the wing streaked with brown."

Lepiselaga crassipes (Fabricius), first reported from Puerto Rico by Dr. H. L. Van Volkenberg in "An Annotated Check List of the Parasites of Animals in Puerto Rico" (Circular No. 22, P. R. Agr. Expt. Station, pp. 1–12, ref. 49. Washington, D. C., January 1939, *also* Proc. Helminthological Soc. Washington, **5** (1): 7–8. Washington, D. C., 1939) as "collected by Luis Enrique Gregory at San Germán, February 1936, also by H. L. Dozier at Lake Guánica, April 1936, det. Alan Stone" is a decidedly rare Tabanid, with no other record from Puerto Rico cited by Dr. Bequaert (1940–285).

Tabanus (Stenotabanus) brunettii Bequaert (1940–319) of Cuba and Hispaniola, is known from Puerto Rico from a single specimen intercepted by Mr. R. G. Oakley at the Bartolomé finca in the mountains above Yauco, previously recorded as *Stenotabanus punctipennis* Brunetti— det. Dr. Alan

Stone. "In life the eye of the female is purplish-black with two narrow bluish-green cross-bands," according to Dr. Bequaert, who quotes in full the description of *Silvius punctipennis*.

Tabanus (Stenotabanus) caribaeorum Bequaert (1940–323), "medium-sized, light yellow, uniformly white pollinose, without markings; antennae pale yellowish with black annuli; legs pale yellow. Wings hyaline, distinctly spotted at cross-veins; length of female 9–12 mm., of male 10–11.5 mm.," occurs in the Cayman Islands and the Bahamas, and also on Mona Island, paratypes having been collected there by Dr. Luis F. Martorell.

Tabanus (Stenotabanus) nervosus, described by Dr. C. H. Curran (1931–4) from Cataño and San Juan, and not known to occur outside of Puerto Rico, but with subsequent records from Pt. Cangrejos, Dorado and Mayagüez, is "related to *T. psammophilus*, but readily recognized by the peculiar spots of the wings, the shape of the frons and the color of the antennae" (yellowish-red), according to Dr. Bequaert (1940–327). In "Insectae Portoricensis" (1923–214) it is listed as *Tabanus psamophilus* O.S.—det. C. T. Greene, with the note "on the beach, resting on dry seaweed, as which it is the same color, and in which its larvae live, feeding on sand fleas, at Pt. Cangrejos and at Vega Baja." Its most outstanding characteristic is the white pollinosity of its body making it almost indistinguishable when resting on dry seaweed.

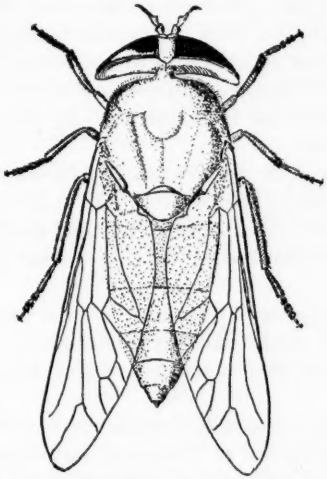
Tabanus (Stenotabanus) parvulus Williston, originally described from Santo Domingo, is known from Puerto Rico from a single female collected by Dr. W. A. Hoffman at Jájome Alto, as listed by Dr. C. H. Curran (1931–6), others noted by Dr. Bequaert (1940–343) having been collected by Dr. Stuart T. Danforth of Gonave Island, Haiti.

Tabanus (Stenotabanus) stigma Fabricius, originally described from St. Thomas, and also known from Antigua, was first recorded from Puerto Rico by Dr. C. H. Curran (1931–4): from Cataño, Dorado and Guayama, a greyish Tabanid, "the abdomen bears distinct, interrupted brownish fasciae on at least several of the segments." Dr. Bequaert (1940–332) records collections at Joyuda (Mayagüez) and Cidra.

Tabanus (Neotabanus) hookeri, described by Mr. F. Knab, from material collected by Dr. C. W. Hooker at Mayagüez, as one of "Some West Indian Diptera" (Insecutor Inscitiae Menustruus, **3** (4): 48–9. Washington, D. C., 1915) is "a small grayish-yellow species," according to Dr. C. H. Curran (1931–6), "the abdomen mostly reddish with three more or less distinct rows of pale spots. It is easily recognized by its small size (10 to 11.5 mm.) and the bare, shining reddish subcallus." He examined specimens collected on Vieques Island by Drs. M. T. Leonard and W. T. M. Forbes, but it is a common species in the coastal areas of Puerto Rico, others having been identified by Dr. Bequaert (1940–361) from Río Piedras, Pt. Cangrejos,

Garrochales and Cartagena Lagoon. It is considered by him as probably occurring all over South America, as well as in Barbados, Trinidad and all of the Greater Antilles.

Tabanus (Neotabanus) truquii Bellardi, according to Dr. Bequaert (1940–352), is known from Puerto Rico only from a single female intercepted at San Juan by Mr. A. S. Mills. It also occurs in Trinidad, the Cayman Islands, the Galapagos Islands, Colombia and in Central America north to the southern United States.



The Tabanid fly, *Tabanus* (*Neotabanus*) *hookeri* Knab, five times natural size. (Drawn by Fritz Maximilien.)

Rhagionidae (Leptidae): Snipe flies

Chrysopilus cubensis, described by Dr. C. H. Curran as one of "New Species of *Chrysopilus* from the Neotropical Region (Rhagionidae, Diptera)" (American Museum Novitates No. 462, p. 9. New York, March 17, 1931), also occurs in Puerto Rico, according to the identification by Dr. M. D. Leonard of a single male collected at Aibonito by Mr. S. S. Crossman, April 23, 1913.

Chrysopilus leonardi, described by Dr. C. H. Curran (1931–4) from a female collected by Dr. M. D. Leonard on Vieques Island, also occurs in Puerto Rico according to the identification of a female from Pt. Cangrejos, June 10, 1920.

Chrysopilus macularis Curran (1931–6) was described from a single female from El Yunque collected by Dr. M. D. Leonard.

Bombyliidae: Beeflies

Hyperalonia cerberus (Fabricius), described as an *Anthrax* from the West Indies, was first listed from Puerto Rico by Herr von Roeder, who identified the specimens which Dr. Gundlach found "muy común en terrenos desmontados." Dr. C. H. Curran (1928–19) lists it from Mona Island, as well as at many points in Puerto Rico, and (1931–7) from Vieques Island. It is a large fly, five-eighths of an inch long, and with a wing spread of almost an inch and a half, the wings mostly chocolate brown, with some clear areas, the abdomen banded with white pubescence near base and near tip, the thorax with stiff, long brown hairs. It is quite common in the coastal areas of the Island. Nothing is known as to the larval habits of this beefly. As *Exoprosopa serveillei* Macquart (never described), Mr. D. W. Coquillett (1900–251) lists as collected in Puerto Rico by Mr. Aug. Busck what is presumably this species.

Exoprosopa cubana Loew, as identified by Herr von Roeder, was found "rara" by Dr. Gundlach in Puerto Rico. Dr. C. H. Curran (1928–19) lists a specimen from Ponce. One collected by Dr. Luis F. Martorell on Mona Island was doubtfully identified by Mr. C. T. Greene as being a species near *E. dodrans* O. S.

Spogostylum "near *pluto* Wiedemann," is the identification by Mr. C. T. Greene of a beefly caught on Playa de Pájaros, Mona Island, by Dr. Luis F. Martorell, and also of one intercepted in a grapefruit grove at Arecibo.

Anthrax adusta Loew, originally described from Cuba, has been found at Guánica, as identified by Mr. C. T. Greene, and elsewhere in Puerto Rico. It is a medium-sized black beefly covered with stiff yellow-brown hairs, its wings yellowish near base.

Anthrax bigradata Loew, originally described from Cuba, was collected in Puerto Rico by Dr. Gundlach, as identified by Herr von Roeder, and listed by them.

Anthrax gideon Fabricius is identified by Dr. C. H. Curran (1928–19) from Ensenada and Mameyes.

Anthrax irroratus Fabricius was the identification by Dr. C. H. Curran of specimens from Utuado and Mayagüez in the AMC collection.

Anthrax oedipus Fabricius was listed from Puerto Rico by Dr. Gundlach.

Villa fauna (Fabricius), first recorded from Puerto Rico as *Anthrax faunus* by von Roeder, identifying specimens collected by Dr. Gundlach, is possibly most abundant in southwestern Puerto Rico, as Dr. Stuart T. Danforth had numerous specimens, as identified by Dr. Curran, from Coamo, Ponce and Mayagüez.

Villa gorgon (Fabricius), first recorded from Puerto Rico as *Anthrax*

gorgon by von Roeder and Dr. Gundlach, was also collected by Mr. Aug. Busck, as noted by Mr. D. W. Coquillett (1900–251), and indeed is possibly the most common local beefly. Dr. C. H. Curran (1928–21) records collections from all parts of coastal Puerto Rico, and Desecheo and Mona Islands, and (1931–8) from Vieques Island. Comparatively small, yellowish-brown, with spotted wings, its appearance by no means suggests its horrid specific name, altho it does indeed mean death to the grubs of the Scoliid wasp, *Elis haemorrhoidalis* (F.), parasitic on the third instar grubs of *Clemora* (or *Phytalus*) *apicalis*. On February 24th, 1922, the sandy field just beyond the bridge over the Bayamón River at Palo Seco was found recently plowed, exposing Scoliid cocoons from two of which the blunt end was cut off by the horns on the puparium of this fly, and adults emerged which were identified by Mr. C. T. Greene. This is reported in "Insectae Portoricensis" (1923–215) and by Mr. Harold E. Box (1925–334), giving a possible clue to the reason why Scoliid parasites are of so little importance in the control of white grubs in Puerto Rico: because of the abundance of beeflies, even tho the specific local host of but one other Bombyliid is known.

Villa lateralis (Say), found in the eastern United States, Mexico and Jamaica, is listed by Dr. C. H. Curran (1928–20) from many Puerto Rican localities, and the Islands of Mona, St. Thomas and St. John, and (1931–7) from Vieques Island.

Villa lucifer (Fabricius), described originally as *Bibio lucifer* from the West Indies, occurs in Louisiana, California, Mexico and the other Greater Antilles, being specifically recorded from Puerto Rico by von Roeder identifying the collections of Drs. Stahl and Gundlach. This is quite a large beefly, dark brown in color, with cloudy brownish wings, yellowish on the fore margins, which Dr. Gundlach found "común—suele posarse en el suelo." Listed by Van Zwaluwenburg (P. R. 78) from Mayagüez, it has most often been collected at Coamo Springs and at Ponce, Guayanilla, Yauco and Guánica on the south coast, also identified from Cartagena Lagoon by Dr. C. H. Curran, and listed by him (1928–21) from Arecibo. Mr. Harold E. Box (1925–342) records it parasitizing the grubs of the Scoliid wasp, *Campsomeris dorsata* F., and Mr. Walter F. Jepson (1936–21) found the adults of this hyperparasite almost as abundant on the flowers of *Kallstroemia maxima* growing on the side of a canefield near Yauco as the wasps themselves.

Phthiria fasciventris was described by Dr. C. H. Curran (1928–21) from a single male from Coamo Springs: "length 4.0 mm., head blackish; mesonotum opaque brown, humeri yellow; posterior calli and scutellum milky white, abdomen rusty brownish-red; wings hyaline, some of the veins with projecting stumps."

Geron senilis (Fabricius), originally described from the West Indies, but

widely distributed in the United States, and specifically known from St. Vincent and Jamaica, was reported from Puerto Rico by Dr. C. H. Curran (1928–22): Caguas and Ensenada, and identified by him from a single specimen collected by Dr. Luis F. Martorell on Mona Island.

Diplocampta roederi, described by Dr. C. H. Curran (1931–8) from specimens collected by Dr. M. D. Leonard on Vieques Island, others from St. Thomas, and from Ensenada, Puerto Rico, is a very dark beefly, 7.5 to 8.0 mm. long, "wings hyaline, with dark brown pattern" darkening the fore margin. "This species is very similar to *paradoxa* Jaennicke, and was identiqed as that species by von Roeder," and by Dr. Curran himself (1928–20): the specimens from St. Thomas and Ensenada, as a *Villa*.

Heterostylum ferrugineum (Fabricius), originally described as a *Bombylius* from the West Indies, was identified by Mr. F. Knab from Puerto Rico, specimens having been collected at Río Piedras, Mayagüez and Ponce. It is an opalescent dark orange in color, for denuded specimens, but normally densely covered with long orange-yellow pubescence, the eyes and antennae dark, the wings hyaline, yellowish at base and on fore margin. Dr. Luis F. Martorell found a single adult flying inside Viejo Lirio Cave on Mona Island, August 8, 1939.

Therevidae: Stiletto Flies

Psilocephala argentata Bellardi, described originally from Mexico, and found also in St. Vincent, was identified by von Roeder and noted by Dr. Gundlach as "rara" in Puerto Rico.

Psilocephala monensis, described by Dr. C. H. Curran (1926–2) from a single female from Mona Island, has "halteres and legs wholly black; front long and very narrow; fourth posterior cell broadly open; length 7.5 mm."

Psilocephala morata Coquillett, as identified by Mr. C. T. Greene, was intercepted in tomato field at Loíza Aldea.

Psilocephala vexans, described by Dr. C. H. Curran (1926–2), the type from St. Thomas, others from El Yunque, Ensenada, Arecibo and San Juan, and many from Mona Island, has "halteres yellow; tibiae and first tarsal segment yellow with brown apices, the two following tarsal segments with yellowish bases; fourth posterior cell closed slightly before the margin of the wing; length 5 to 8 mm."

Asilidae: Robber Flies

Leptogaster cubensis (Bigot), collected in Puerto Rico by Dr. Gundlach and identified by von Roeder, was reported from Mona Island by Dr. C. H. Curran (1928–22).

Atomosia incisuralis Macquart, originally described from Cuba, is listed by Mr. R. H. Van Zwaluwenburg (P. R. 2708), and has since been repeat-

edly intercepted in Puerto Rico: in grapefruit groves at Bayamón, Añasco and Mayagüez. This is a clear-winged, little black fly, 6.0 mm. long, the fifth abdominal segment much the largest, all narrowly margined with white. Specimens of this genus in the AMC collection were considered by Dr. C. H. Curran to be a new species.

Ommatius marginellus (Fabricius), described as an *Asilus* from the West Indies, and having a wide neotropical distribution, was collected by Dr. Gundlach in Puerto Rico and listed by Van Zwaluwenburg (P. R. 107). It is quite a large black Asilid, the distal portion of the wings being opaquely ribbed, and occurs everywhere in coastal Puerto Rico, Dr. Luis F. Martorell having found it also on Mona Island.

Plesioma species "near *indecora* Loew" is the identification by Mr. C. T. Greene of another Asilid fly collected by Dr. Luis F. Martorell on Mona Island.

Allopogon danforthi was described by Dr. C. H. Curran in "New American Asilidae (Diptera)" (American Museum Novitates No. 806; 1–2. New York, 1935) on p. 8, the type from Puerto Rico, collected by Dr. Stuart T. Danforth.

Saropogon dispar Coquillett, as identified by Mr. C. T. Greene, has been intercepted in Santurce.

Townsendia argyrata was described by Dr. C. H. Curran (1926–1), the type from El Yunque, others from Coamo: "front brown pollinose except on the sides and lower portion; third antennal segment tapering from near base; anterior four tibiae silvery white pruinose; apex of each abdominal segment of the female reddish, length 4.0 mm."

Townsendia minuta Williston, as identified by Mr. C. T. Greene, was intercepted near Ensenada by Mr. R. G. Oakley.

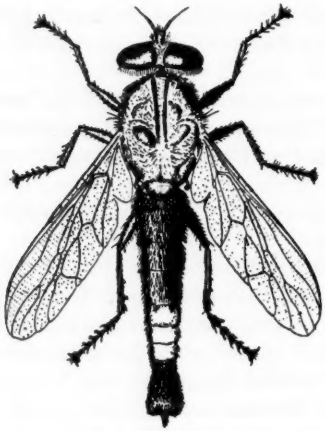
Proctacanthus rufiventris Macquart, originally described from Santo Domingo and Honduras, was identified by von Roeder and listed by Dr. Gundlach from Puerto Rico, but Dr. Stahl used the name *Proctacanthus lutescens* Loew. Mr. Aug. Busck found this, the largest, most powerful and possibly the most abundant of the Asilids of Puerto Rico, as noted by Mr. D. W. Coquillett. Repeated collections have been made since in all parts of the Island: twice noted carrying large grasshoppers, and another carrying a wasp, *Polistes crinitus*, at Aguada. The basal segment of its long, tapering abdomen is the darkest, the next two the brightest yellow-orange, the others darker yellow and narrower, the entire insect being from an inch to an inch and a quarter in length.

Erax bastardi Macquart was the identification by Herr Victor von Roeder of the Asilid fly which Dr. Gundlach listed as *Erax femoratus* Macquart; omitted by Dr. C. H. Curran (1931–9) from his table, "since the record is almost certainly based on a misidentification," altho it would appear that

this older name, based on specimens from Santo Domingo and Guiana, would have priority. *Erax* are large, grey flies, the males having part or all of the fifth to eighth abdominal segments silvery.

Erax forbesi Curran (1931–10) is 17 to 19 mm. long, "abdomen black, the sixth and seventh segments silvery," the type from Coamo Springs. To specimens in the AMC collection, from Coamo, Villalba, Yabucoa, Utuado and Mayagüez, Dr. Curran gave the MS name of *danforthi*.

Erax portoricensis was described by Prof. J. S. Hine (Ann. Ent. Soc. America, **12** (2): 128. Columbus, June 1919) from a single male from Ensenada, which had segments six and seven of the abdomen silvery.



The Asilid fly, *Erax bastardi* Macquart, three times natural size. (Drawn by Fritz Maximilien.)

Erax stylatus (Fabricius), originally described as an *Asilus* from the West Indies, is considered by Dr. Curran (1931–9) probably to be the *Erax rufitibia* Macquart of Haiti, which was Herr Victor von Roeder's identification (1885–339) of what Dr. Gundlach had collected in Puerto Rico, and also that of Mr. F. Knab of what Mr. R. H. Van Zwaluwenburg had found at Mayagüez. Specimens answering to the description in Dr. Curran's key have been taken in flight at Santa Isabel and attracted to light in the Guánica Forest.

Erax tortola Curran (1928–23), originally described from Tortola and St. Thomas, is represented in the AMC collection with specimens from Coamo and Mayagüez, as determined by Dr. Curran.

Dolichopodidae: Long-legged Flies

Chrysotus brevitibia was described by Mr. M. C. Van Duzee from a single male collected at Naguabo by Dr. Frank E. Lutz, one of the "New Dolichopodiae from the West Indies" (American Museum Novitates No. 262, p. 10, New York, March 29, 1927): "palpi whitish; front green; thorax blackish, scutellum green; abdomen very dark green, length 1.6 mm." With the "face of male usually much narrower than the front, the abdomen without strong bristles at apex," according to Dr. C. H. Curran (1928–27), "the members of this genus are among the smallest of the Dolichopodidae and are found on leaves and grass, especially in the vicinity of streams and swamps."

Chrysotus barbatus (Loew), originally described from the Middle West of the United States, but also reported from St. Vincent and Grenada, was listed by Mr. D. W. Coquillett collected in Puerto Rico by Mr. August Busck.

Chrysotus excavatus Van Duzee is listed by Mr. M. C. Van Duzee (*in* Curran 1928–28) from Aibonito, and has been since intercepted in a grapefruit grove at Arecibo.

Chrysotus flavus Aldrich, originally described from St. Vincent, is listed by Mr. Van Duzee (*in* Curran 1928–28) from Adjuntas.

Chrysotus flavohirtus Van Duzee would appear to be a relatively common species in Puerto Rico, listed by Mr. Van Duzee (*in* Curran 1928–28) from Arecibo, Manatí, Orocovis, Adjuntas and Coamo Springs.

Chrysotus inermis Aldrich, originally described from St. Vincent, and known from Cuba according to Mr. Van Duzee (*in* Curran 1928–28), is represented in Puerto Rico by a specimen from Mayagüez.

Chrysotus longipes was described by Mr. M. C. Van Duzee (1927–1) as being "very much like *inermis* Aldrich, but has the cross-vein at the middle of wing; the cilia of the calypters yellow, not brown as in *inermis*; the wings are not at all yellow and the palpi are all yellow." This is apparently a common species in Puerto Rico, described from eighteen specimens, length 1.8 mm., front of face of male blue, "its sides nearly parallel, green, thickly covered with gray pollen; thorax dark shining green with gray pollen; abdomen bronze-green, its hairs mostly yellow." The AMC collection contains specimens identified by Dr. Curran from Cidra, Mayagüez, Hormigueros and Cartagena Lagoon.

Chrysotus minuticornis was described by Mr. M. C. Van Duzee (1927–3) from a single specimen collected at Naguabo by Dr. Frank E. Lutz.

Chrysotus morrisoni Van Duzee is reported (*in* Curran 1928–29) from five Puerto Rican localities.

Chrysotus picticornis Loew, found in middle western and southern United States, Mexico and St. Vincent and Grenada, is listed by Mr. M. C. Van Duzee (*in* Curran 1928–27) from three Puerto Rican localities. It has been intercepted, swept from weeds at Naguabo, as identified by Dr. J. M. Aldrich.

Diaphorus simplex (Aldrich), originally described as a *Lyroneurus* from St. Vincent, found also in Grenada and Mexico, was listed from Puerto Rico by Mr. M. C. Van Duzee (*in* Curran 1928–29) at Aibonito, Caguas and Mayagüez.

Asyndetus interruptus (Loew), originally described as a *Diaphorus* from Cuba, is listed from San Juan, Puerto Rico by Mr. M. C. Van Duzee (*in* Curran 1928–29).

Asyndetus exiguus, described by Mr. M. C. Van Duzee (1927–4) from four males and two females collected by Mr. A. J. Mutchler on seagrape at Arecibo, "is much like *interruptus* Loew but is smaller (length 2 to 2.5 mm.); it has only delicate hairs on the lower surface of femora; the bristles on upper edge of tibiae are few and weak." The face of the male is "opaque with white pollen; palpi, proboscis and antennae black; thorax green with blue and bronze reflections, dorsum covered with thick white pollen; abdomen green with considerable white pollen."

Kierosoma albicincta Van Duzee, as identified by Mr. C. T. Greene, was found in great abundance resting on the walls of the Presbyterian Hospital in the Condado in March 1945. Described originally (1928–24) from Barro Colorado Island, C. Z., and from Biscayne Bay, Florida, this Dolichopodid fly has not previously been recorded from the West Indies.

Thrypticus fraterculus (Wheeler), described originally as an *Alphantotimus* from Wisconsin, but later found in Mexico, was listed by Mr. M. C. Van Duzee (*in* Curran 1928–30) from Puerto Rico: a single male with green femora from Naguabo.

Thrypticus violaceus Van Duzee, described from a single male collected by Dr. Frank E. Lutz at Arecibo, has the legs wholly pale. It is 1.5 mm. long, "face and front bright violet; dorsum of thorax green, anterior portion and scutellum violet; abdomen bright green with blue reflections; all bristles and hairs yellow." It has since been found at Aibonito and Coamo in Puerto Rico, and collected by Dr. Frank E. Lutz on Mona Island.

Plagioneurus univittatus Loew, originally described from Cuba, and recorded from Hispaniola, Florida and northern States, as well as Brasil and Grenada, is listed from Puerto Rico by Mr. M. C. Van Duzee (*in* Curran 1928–30): a single male from Cayey. Dr. C. H. Curran identified specimens in the AMC collection from Salinas, Cartagena Lagoon, San Germán, Sabana Grande and many from Mayagüez, while interceptions have been made at Añasco, Ciales and Guayama.

Gymnopternus sp. was the identification by Mr. C. T. Greene of a fly intercepted on weeds at Caguas. The only species of this genus recorded from the West Indies is *ruficornis* Aldrich, from St. Vincent.

Paraclius femoratus Aldrich, originally described from Mexico, is listed from Mayagüez, Puerto Rico by Mr. M. C. Van Duzee (*in* Curran 1928–30), having its "posterior femora broadly brown apically."

Paraclius filifer Aldrich, described originally from St. Vincent and known to occur in Grenada and Florida, was collected on Vieques Island by Mr. Aug. Busck as recorded by Mr. D. W. Coquillett.

Pelastoneurus aequalis Van Duzee (1927–5), described from a pair from Adjuntas, Puerto Rico, is most "nearly like *floridanus* Wheeler, but has the hypopygial lamellae longer, and oval; and the last section of fourth vein bent near basal third." These flies are 3.0 mm. long, with "thorax largely dark blue with green reflections; abdomen and scutellum green with coppery reflections."

Pelastoneurus fasciatus was described by Herr Victor von Roeder (1885–340) from material collected by Dr. Gundlach, presumably at Mayagüez, "observando solamente en Puerto Rico."

Mesorhaga albiciliata Aldrich, as identified by Dr. J. M. Aldrich, was taken by Mr. E. G. Smyth in the screen trap in the garden at Hda. Santa Rita, Guánica, June 30, 1914.

Sciapus albiciliatus, described as a *Psilopus* by Mr. M. C. Van Duzee (1927–10), the type from St. Thomas, others from Mona Island and from San Juan, Puerto Rico, is "a rather small, shining species with black or metallic femora, yellow tibiae and halteres; long white hair on lower surface of femora and with the fore tarsi ornamented with little bristles of long hair; length 4.3 mm." Its thorax and scutellum are blue, the abdomen green with coppery reflections.

Sciapus chrysoprasius (Walker), a widely-distributed neotropial Dolichopodid, was collected in Puerto Rico first by Dr. Gundlach and listed as a *Psilopus* by Herr Victor von Roeder. Specimens collected in grapefruit groves near Río Piedras and Vega Alta by Dr. Richard T. Cotton were identified by Dr. J. M. Aldrich as *Psilopus cilipes* Aldrich, as listed in "Insectae Portoricensis" (1923–216), and others have since been intercepted in a grapefruit grove at Añasco. Mr. M. C. Van Duzee (*in* Curran 1928–33) places these species in synonymy, and records collections from Corozal and Naguabo.

Sciapus diffusus (Wiedemann), originally described from Brasil and also found in Mexico, was identified for Dr. Gundlach from Puerto Rico and reported by Herr Victor von Roeder. Dr. Curran identified specimens in the AMC collection from Mayagüez and Ponce as being in the genus *Condylostylus*; repeated interceptions have been made at Mameyes, San Juan,

Manatí and Arecibo, and Mr. M. C. Van Duzee (*in* Curran 1928–32) reports additional collections at Cayey and Adjuntas, and occurrence in Haiti, Jamaica and Cuba.

Sciapus digitatus Van Duzee, occurs in Cuba, Jamaica, Haiti and Dominica, according to its describer (*in* Curran 1928–32), and was found in Puerto Rico at Cayey.

Sciapus dimidiatus (Loew), a widely-distributed neotropical Dolichopodid listed by Dr. Aldrich as *Agonosoma dimidiatum*, was identified as a *Psilopus* by Herr Victor von Roeder for Dr. Gundlach's collection in Puerto Rico.

Sciapus dorsalis (Loew) is listed from Puerto Rico by Mr. M. C. Van Duzee (*in* Curran 1928–32), having been collected at Manatí, Arecibo and Aibonito.

Sciapus flavicornis (Aldrich), originally described as a *Gnamptopsilopus* from St. Vincent, is listed from Puerto Rico by Mr. M. C. Van Duzee (*in* Curran 1928–32), and also from Jamaica.

Sciapus graenicheri (Van Duzee) was first listed from Puerto Rico as *Psilopus caudatus* Wiedemann, as determined by Dr. J. M. Aldrich, in "Insectae Portoricensis" (1923–216), and subsequently noted as forming part of the food of a lizard: *Anolis krugii*. Dr. Stuart T. Danforth noted this fly as being eaten by the P. R. mango (1926–90), using the name *Condylostylus* given by Dr. Curran to specimens he had collected at Yauco, Joyuda, Mayagüez and Río Piedras. Mr. M. C. Van Duzee (*in* Curran 1928–33) lists numerous other localities of collection, the extremes being Tortuguero Lagoon and El Yunque.

Psilopus "near *insularis* Aldrich" was the determination by Mr. C. T. Greene of a Dolichopodid fly collected by Dr. Luis F. Martorell on Mona Island.

Sciapus jucundus (Loew), originally described from Cuba but recorded from many of the West Indies, was collected in Puerto Rico by Dr. Gundlach as identified by Herr Victor von Roeder, and has since been intercepted in a lima bean field at Vega Baja.

Sciapus leonardi Van Duzee, named after its collector, Dr. M. D. Leonard, occurs in the Okefenoke Swamp, Georgia (type locality), but also in Haiti, Dominica and Puerto Rico, according to Mr. M. C. Van Duzee (*in* Curran 1928–32), at Aibonito, Adjuntas and Tortuguero Lagoon.

Sciapus longicornis (Fabricius), described originally as a *Dolichopus* from the West Indies, was listed by Mr. D. W. Coquillett (1900–252) as having been collected in Puerto Rico by Mr. Aug. Busck.

Sciapus melampus (Loew), a Mexican Dolichopodid, has been identified as a *Psilopus* by Mr. C. T. Greene, intercepted on weeds at Mayagüez by Mr. A. G. Harley.

Sciapus mundus (Wiedemann), from Florida and Georgia, was identified by Dr. J. M. Aldrich as *Psilopus ciliatus* Loew, from Corozal, Puerto Rico.

Sciapus nubilipennis (Van Duzee) was described as a *Psilopus* (1927–7): a single male from Adjuntas, 5.5 mm. long, "with wings nearly like those of *infumatus* Aldrich, except that the costa is not ciliated; the middle basitarsus is ciliated below the erect bristles, which are longer than the diameter of the joint," with head, thorax, scutellum and abdomen mostly green.

Sciapus pilosus (Loew) was identified by Herr Victor von Roeder as a *Psilopus* from material collected in Puerto Rico by Dr. Gundlach, formerly known only from Cuba.

Sciapus portoricensis, described as a *Psilopus* by Jean Macquart in his "Histoire Naturelle des Diptéres" (**1:** 450, **2:** 121, Paris, 1934–35), has since been intercepted at Mayagüez and at Loíza.

Sciapus pruinosus Coquillett is listed from Puerto Rico at Aibonito and Adjuntas by Mr. M. C. Van Duzee (*in* Curran 1928–33), and has since been intercepted at Maricao.

Sciapus psittacinus (Loew), a Florida Dolichopodid, was identified from Puerto Rico by Herr Victor von Roeder as a *Psilopus* collected by Dr. Gundlach.

Sciapus spinimanus (Van Duzee), described (1927–6), the type from "Sánchez, P. R.," is presumably not a Puerto Rican species, and indeed it seems quite possible that other records by Mr. Van Duzee given as "Dominica" refer, not to the Island in the Lesser Antilles of that name, but to the Dominican Republic, the eastern portion of the Island of Hispaniola.

Sciapus unicinctus (Van Duzee), described as a *Psilopus* (1927–6) from a pair from Aux Cayes, Haiti, other from St. John (U. S. Virgin Islands), is identified by Dr. C. H. Curran (1931–11) from material collected by Dr. W. A. Hoffman at Dorado, Puerto Rico. It is 5.0 mm. long, "front blue; lower part of face green, both covered with silvery white pollen; thorax blue with green reflections and rather short black bristles; abdomen green with black incisures and coppery reflections."

Empididae: Dance Flies

Phoneustica flavida (Williston), described as a *Drapetis* from St. Vincent, was identified as a *Tachydromia* by Mr. D. W. Coquillett (1900–251) reporting its collection in Puerto Rico by Mr. Aug. Busck. Dr. C. H. Curran (1928–25) reports collections at Mayagüez and Coamo, and later identified as this species those collected by Dr. Stuart T. Danforth at Cartagena Lagoon.

Drapetis gilvipes Loew, originally described from Texas, and reported from St. Vincent as *Drapetis xanthopodus,* occurs in Puerto Rico according to Dr. C. H. Curran (1928–25): a single male from Cayey.

Syneches pusillus Loew, recorded from St. Vincent, occurs in Puerto Rico according to Dr. C. H. Curran (1928–25): a single female from Orocovis.

Hybos electus Melander, of the clear-winged variety named *claripennis* by Dr. C. H. Curran (1928–25) from a male from Adjuntas, was previously known from Cuba and St. Vincent.

Hybos triplex Walker, originally described from Trenton Falls, New York, was listed from Puerto Rico by Mr. D. W. Coquillett (1900–251) as *Euhybos subjectus*, collected by Mr. Aug. Busck.

Hybos spinosus Curran (1928–25), the type a male from Adjuntas, Puerto Rico, 3.0 mm. long and black, differs from *triplex* Walker in "the largely pale anterior legs and different genitalia."

Euhybos spiniger, described by A. L. Melander in "Diptera: Empididae" of Genera Insectorum, fasc. **185**: 32. Brussels, 1927, the type from Utuado, Puerto Rico, "Dr. Curran thinks," according to Dr. M. D. Leonard, this "may be the same as his *Hybos spinosus*."

Phoridae: Humpbacked Flies

Megaselia aurea (Aldrich), described as a *Phora* from St. Vincent, was collected in Puerto Rico by Mr. Aug. Busck, as noted by Mr. D. W. Coquillett (1900-253).

Megaselia macrochaeta (Malloch) and **Megaselia subflava** (Malloch) are listed by Mr. R. H. Van Zwaluwenburg as *Aphiochaeta*, and as an *Aphiochaeta* Dr. J. M. Aldrich determined the specimens of **Megaselia picta** (Lehmann) which Mr. E. G. Smyth found attracted to "some dead *Belostoma* adults collected two nights ago." As a species of *Megaselia* "very close to *fungicola* (Coquillett)," Mr. C. T. Greene identified the Phorid flies intercepted on a polypore fungus.

Megaselia scalaris (Loew) is a common, cosmopolitan Phorid, described as a *Phora* from Cuba, and early reported from St. Vincent and Grenada and the eastern United States. Dr. G. E. Bohart in his paper on "The Phorid Flies of Guam" (Proc. U. S. National Museum, **96** (3205): 397–416, pl. 5, ref. 8. Washington, D. C., 1947), figures both sexes and re-descr bes this species, which he found "abundant in all inhabited areas and bred freely in such diverse materials as green cornstalks, rotting coconuts, carrion and human excrement. It was almost impossible to keep it from contaminating our cultures of other flies, and it bred freely in fresh stools under examination for intestinal parasites by the parasitology laboratory." In Puerto Rico it has been intercepted in the rotten silk of sweet corn at Mayagüez, in rotten fruit of *Annona glabra* at Palo Seco, in rotten papaya fruit at Arecibo, in hot pepper fruit at Arroyo, and without host record at Bayamón and Adjuntas. It has been repeatedly reared from dead May

beetles, from dead termites poisoned with Paris green, and from other dead insects. Dr. C. H. Curran (1928-43) reports more than forty specimens collected by Dr. Frank E. Lutz on Mona Island, and occurrence in others of the Greater Antilles.

Dohrniphora venusta (Coquillett), as identified by Mr. C. T. Greene, has been reared from dead termites, *Nasutitermes costalis* Holmgren, killed by Paris green in the comejenera, and from other dead insects, as well as from decaying bean pods at Río Piedras.

Conicera latimana, described by Mr. J. R. Malloch as "A New Species of *Conicera* from Puerto Rico" (Proc. Ent. Soc. Washington, **26** (4): 73. Washington, D. C., April 1924), was from a type from Ciales. Presumably it was this species, identified as *Conicera aldrichii* Brues, which Dr. Alex. Wetmore found eaten by a hummingbird.

Puliciphora borinquensis was described by Dr. Wm. Morton Wheeler as "A New Wingless Fly from Porto Rico" (American Museum of Natural History, Bulletin No. 12, Article 14, pp. 267–71, pl. 34. New York, 1906).

Syneura cocciphila (Coquillett), originally described as a *Phora* from Mexico, reared from "larvae infesting dead adults of *Icerya purchasi*," was first reared from the same host in Puerto Rico by Mr. Francisco Seín shortly after the cottony cushion scale became established in the metropolitan area of San Juan. This was reported by Dr. M. D. Leonard (1932-1106), by Dr. C. T. Brues (Psyche, **39** (4): 141. Cambridge, December 1932) and by Wolcott & Seín (1933-213). At Sao Paulo it has been found infesting *Icerya brasiliensis*, and in Puerto Rico has been reared from *Crypticerya rosae* R. &. H., at Ponce. On Mona Island it was reared from adult cottony cushion scales.

Syrphidae: Flower Flies

Baccha capitata Loew, originally described from Cuba, was first collected in Puerto Rico by Dr. Gundlach and listed by Victor von Roeder, and in Van Zwaluwenburg's list is No. 5035, "on *Aphis* sp." It is a large, yellow and brown fly, with the broadly spatulate abdomen characterizing many of this genus, but decidedly not abundant, adults having been reared from the dull yellow, opalescent puparia at Comerío, Vega Baja and Río Piedras. Mr. Thos. H. Jones noted them associated with hemispherical scales. Dr. M. R. Smith (1942-26) in the coffee region back from Mayagüez found the larvae on coffee twigs not attacked by ants, altho "often observed destroying scales."

Baccha clavata (Fabricius), originally described as a *Syrphus* from the West Indies but since found widely distributed in the United States, Mexico, Brasil and and the Galápagos Islands, was first collected in Puerto Rico by Dr. Gundlach, as identified by Herr Victor von Roeder. It was also found

by Mr. Aug. Busck, as listed by Mr. Coquillett, and is given in Van Zwaluwenburg's list as P. R. 88. The adult is a slender, blue-black fly, with two yellowish spots on either side of the spatulate abdomen, the larvae being so common as predators on aphids of all kinds on numerous wild hosts as well as on economic plants, that larva, puparium and adult are figured in "Afidos de Importancia Económica en Puerto Rico" (Circular No. 59, Est. Expt. Insular, Río Piedras, pp. 11, fig. 20. San Juan, September 1922). These flies occur in all parts of Puerto Rico, and are possibly most often noted ovipositing among colonies of aphids, but they also suck exuding sap from corn leaves and have been noted feeding on nectar from coffee flowers.

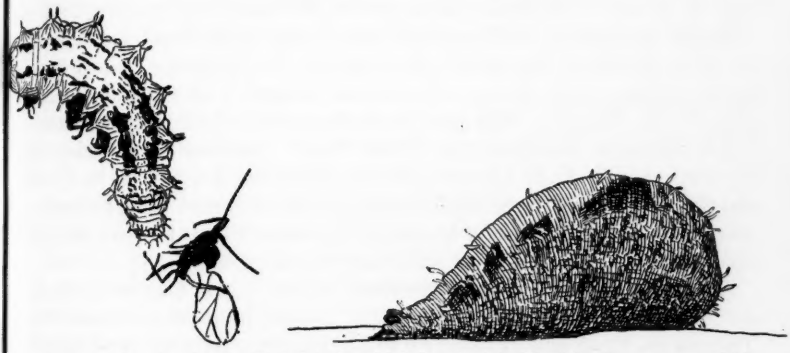
The Syrphid fly, *Baccha clavata* (Fabricius), six times natural size. (Drawn by G. N. Wolcott.)

Baccha (Ocyptamus) conformis Loew, originally described from Cuba, was first collected by Dr. Gundlach in Puerto Rico, presumably at Mayagüez, as listed by von Roeder. In Van Zwaluwenburg's list it is P. R. 1207, and has since been intercepted on mango blossoms at Mayagüez. It is a slender, entirely black Syrphid fly, which Dr. Luis F. Martorell found "flying very low" under trees of "corcho" (*Pisonia albida*) growing along the Carmelita trail on the plateau of Mona Island.

Baccha cylindrica (Fabricius), originally described as a *Syrphus* from the West Indies, is identified by Dr. C. H. Curran (1928-36) from all of the larger Virgin Islands, from El Yunque, Arecibo and Mayagüez in Puerto Rico, and from Mona Island, and in the AMC collection from many more Puerto Rican localities.

Baccha (Ocyptamus) dimidiata (Fabricius), described as a *Syrphus* from the West Indies, and since found in Mexico and the Amazona region of Brasil, is identified by Dr. C. H. Curran (1928-36) from all the larger Virgin Islands, and from El Yunque, Cayey, Aibonito and Mayagüez.

Baccha (Ocyptamus) fasciatus, described from Puerto Rico by Herr Victor von Roeder (1885-342), the type collected by Dr. Gundlach, and noted by him as "observado solamente en Puerto Rico," is large, slender, dark blue, with pictured wings. The larvae have been observed feeding on aphids on coffee leaves at Indiera in the mountains back of Yauco, and on milkweed aphids on the giant milkweed (*Calotropis procera*) at Yauco. Adults have been collected in a cane field at Salinas, and flying among weeds on Mona Island by Dr. Luis F. Martorell.



Larva of *Baccha clavata* (Fabricius), which has just finished feeding on an aphid, and puparium, both about six times natural size. (Drawn by G. N. Wolcott.)

Baccha (Ocyptamus) fuscipennis Say, as determined by Mr. C. T. Greene, has been intercepted at Palo Seco and Dorado.

Baccha gracilis Williston was identified by Dr. C. H. Curran (1928-35) from El Yunque.

Baccha incompta Austen, originally described from Brasil, was identified by Dr. C. H. Curran (1928-36) from Adjuntas.

Baccha (Ocyptamus) latiusculus Loew, originally described from Cuba and recorded from the other Greater Antilles, was collected in Puerto Rico by Dr. Gundlach, as listed by Herr von Roeder, and by Mr. Aug. Busck, as noted by Mr. D. W. Coquillett. Mr. Thos. H. Jones, writing on the "Aphides or Plant-Lice attacking Sugar-Cane in Porto Rico" (Bulletin No. 11, Board of Commissioners of Agriculture P. R., pp. 19, pl. 2. San Juan, 1915), noted the larvae, called a species of *Ocyptamus*, feeding on the yellow aphid of sugar-cane, *Sipha flava* Forbes. They feed on any kind of aphid on any host, even on water lily, and occur in all parts of the Island in great abundance. The adults have a parallel-sided abdomen, bright chestnut in color in life, becoming darker in museum specimens.

Baccha ornatipes was described by Dr. C. H. Curran (1927-3) from a single male from Cayey.

Baccha parvicornis Loew, described originally from Cuba, was first collected in Puerto Rico by Dr. Gundlach, as recorded by Herr von Roeder. It is a large but very slender Syrphid fly, light yellow in color, present in all parts of the Island. Of an adult reared from a puparium on the under side of a coffee leaf covered with fluff from the nymphs of *Ormenis pygmaea*, it may be presumed that the larva had fed on the Fulgorid nymphs. Apparently the maggots are not specific in their choice of hosts however, for others have been found associated with a heavy whitefly infestation on the leaves of *Inga laurina* at Cabo Rojo, and with a heavy infestation of mealybugs on a leaf of *Erythrina glauca* at Río Piedras.

Baccha stenogaster Williston, previously known from Brasil and Mexico, was first identified from Puerto Rico by Mr. C. T. Greene, reared from larvae feeding on mealybugs, *Phenacoccus gossypii* T. & C., on cotton at Maunabo in February 1922, and the next year found feeding on *Pseudococcus adonidum* mealybugs on "New York" (*Solanum wendlandii*) at Río Piedras. Dr. C. H. Curran (1928–35) identified this fly from St. Croix and St. Thomas, and from Adjuntas and Coamo in Puerto Rico, and many specimens from Mayagüez for Dr. Stuart T. Danforth. It is a very slender, small, dark fly, with clear but somewhat whitish wings.

Allograpta fuscisquama was described by Dr. C. H. Curran (1927-4), the type from Ensenada, Puerto Rico; others from Mona Island, St. Thomas, St. Croix and Tortola; 7.0 to 8.5 mm. long, yellowish head, thorax shining greenish black, legs reddish yellow, the abdomen with a complicated pattern in yellow, brown and black. Dr. Curran identified specimens in the AMC collection from Yauco, Villalba, Coamo, Utuado, Río Piedras and Humacao.

Allograpta limbata (Fabricius), originally described as a *Scoeva* from the West Indies, was identified from Puerto Rico by Mr. C. T. Greene: adults reared from larvae and pupae in the arrows or "guajanas" of sugar-cane at Río Piedras and Cidra, presumably feeding on the leafhoppers or leafhopper nymphs of *Nesosteles guajanae* (DeLong). The dark brown, half-moon shaped spot on the bright yellow scutellum is conspicuous, and corresponds with what Dr. Curran describes for his *fuscisquama*—"Scutellum dull yellow with a large, transverse, discal black spot, the pile long and sparse; ventral fringe black, long" so closely, and in other details, as to suggest the synonymy of the two names.

Mesogramma arcifera Loew, originally described from Cuba as *Mesograpta arcifer*, and known also from Jamaica, was first collected in Puerto Rico by Mr. Aug. Busck, as listed by Mr. Coquillett, and in Van Zwaluwenburg's list is P. R. 109. Its black scutellum is outlined apically in yellow, the second segment of the abdomen has two semi-circular yellow marks, those more distad are yellow with obscure brownish markings. Dr. C. H.

Curran (1928-41) lists collections from many points in Puerto Rico, and indeed it is one of the most abundant of Syrphid flies, especially in high malojillo meadows. It has been repeatedly intercepted on mango flowers at Mayagüez, but it has not been reared, and nothing is known of its immature or host relationships.

Mesogramma aurulenta Williston, originally described from Santo Domingo, was identified by Mr. C. T. Greene from a specimen collected by Mr. S. S. Crossman at Aibonito, which has a reddish abdomen except at base. Others are from El Yunque.

Mesogramma basilare (Wiedemann), originally described from Brasil, and known from several of the Lesser Antilles, was identified as *Toxomerus* by Prof. C. L. Metcalf from Puerto Rico: swept from grass at Coloso, Manatí, Caguas and Point Cangrejos.

Mesogramma boscii (Macquart), of the eastern United States and Mexico, was identified as a *Mesograpta* by von Roeder, and listed by Drs. Stahl and Gundlach from Puerto Rico.

Mesogramma duplicata (Wiedemann), a South American Syrphid, is listed by Dr. C. H. Curran (1928-38) from many localities in Puerto Rico.

Mesogramma difficilis, described by Dr. C. H. Curran as one of "New Diptera belonging to the Genus *Mesogramma* Loew (Syrphidae)" (American Museum Novitates Number 405, pp. 14, fig. 3. New York, March 1, 1930) from a single male from Coamo, others from Caguas, Adjuntas, Aibonito, Corozal, and Manatí, is "related to *duplicatus* Wiedemann, having a length of 5.5 to 6.0 mm., face and front yellow, mesonotum greenish black, abdomen orange, with black bands and spots".

Mesogramma floralis (Fabricius) was identified by Dr. C. H. Curran (1928-39) from many localities in Puerto Rico and from the Virgin Islands of St. Thomas and St. John.

Mesogramma laciniosa Loew, originally described from Cuba, was identified for Dr. Gundlach in Puerto Rico by Herr Victor von Roeder, and listed by Mr. C. W. Coquillett as collected by Mr. Aug. Busck. Dr. C. H. Curran (1928-39) notes that he had "seen specimens labeled Porto Rico," and later identified many from Mayagüez and other localities in the AMC collection. It is indeed a very common Syrphid in malojillo meadows and pasture grass and weeds, identified by Prof. C. L. Metcalf as a *Toxomerus*, and thus reported as forming an item in the food of the lizard *Anolis pulchellus*.

Mesogramma minuta (Wiedemann), originally described as a *Syrphus* from Brasil, and reported also from Cuba, is listed by Dr. Gundlach as a *Mesograpta* "rara en Puerto Rico."

Mesogramma musicus (Fabricius) is listed from Puerto Rico by Dr. C. H. Curran (1928-39): a single specimen from Corozal.

Mesogramma picta (Macquart), originally described as a *Syrphus* from Guiana, and known also from Mexico, Cuba and Jamaica, was listed by Dr. C. H. Curran (1928-41) from Puerto Rico: Aibonito and Corozal, and specimens from Añasco and many other localities in the AMC collection were identified by him.

Mesogramma polita (Say), a common continental North American Syrphid fly, reported by C. V. Riley and L. O. Howard in "Insect Life" (1: 5–8. Washington, D. C., July 1888) as "The Corn-Feeding Syrphus Fly," its larvae feeding on pollen and tissues of corn, was first noted in Puerto Rico by Dr. Richard T. Cotton (1918-291), who found the adults "very abundant on corn and some of the native wild grasses. The yellowish colored grubs feed on pollen grains and on the saccharine cells in the axils of the leaves. The grubs pupate between the stalk and the leaf-sheath. Parasitic enemies are numerous." Dr. C. H. Curran (1928-38) notes occurrence in Puerto Rico, and identified specimens in the AMC collection from Mayagüez and many other localities in Puerto Rico. This Syrphid fly was found to be an item in the food of the crested lizard, *Anolis cristatellus*. It has clear wings, light colored thorax and light brownish crescents on several of the segments of a yellowish abdomen.

Mesogramma polygonastyla Metcalf, given this MS name by Prof. C. L. Metcalf "because of the peculiar shape of the styles of the male", was reared from numerous puparia on tobacco plants at Caguas, May 10, 1921. It is presumed that the larvae fed upon other insects which might become stuck to the tobacco leaves.

Mesogramma subannulata Loew, originally described from Cuba and found also in Jamaica and Mexico, was first collected in Puerto Rico by Mr. Aug. Busck, as reported by Mr. D. W. Coquillett (1900-253). Mr. Thos. H. Jones found the larvae feeding on the yellow aphid of sugar-cane, *Sipha flava* Forbes, and Dr. Richard T. Cotton observed females "depositing eggs around colonies of aphis (*Rhopalosiphum persicae* Sulzer) on pepper plants" at Río Piedras. The adults have been swept from grass at Caguas, Ciales and Mayagüez, and are common in at least the more humid sections of the Island.

Mesogramma verticalis, described by Dr. C. H. Curran (1927-6) from a single male at Cayey, has an "abdomen black, with four broadly interrupted yellow fasciae, the last three of which are broadened inwardly; length 5.0 mm."

Mesogramma violacea Curran, originally described from Jamaica, was identified by Dr. C. H. Curran (1928-39) from El Yunque and other localities in the mountains of Puerto Rico, as well as from Arecibo and Mayagüez.

Ornidia obesa (Fabricius), described as a *Syrphus* from the West Indies,

but more generally known as a *Volucella* with a wide distribution in South America, tropical Asia, the Sychelles and Madagascar, is by Dr. C. H. Curran in his "New Species of Volucellinae from America (Syrphidae, Diptera)" (American Museum Novitates Number 413, pp. 23, fig. 1. New York, March 24, 1930) re-established in the genus proposed by St. Fargeau et Serville, having "strong tubercles on the side of the face". This is a large, stout, iridescent green fly, commonly known locally under the name of "mosca cantárida." It was identified by Herr von Roeder for Drs. Stahl and Gundlach, the latter noting it as "sumamente común en los montes." Listed by Van Zwaluwenburg as P. R. 92, it was found by Dr. Stuart T. Danforth (1926-92, 122) to have been eaten by the tody and the northern water thrush at Cartagena Lagoon. Dr. Curran (1928-41) identified it from many localities in Puerto Rico in all parts of the Island, along the coast as well as in the mountains. It typically hovers in a sunny glade, a clearing in the woods or little traveled mountain road, and Mr. Thos. H. Jones collected a plump, grey puparium at the camp on El Duque, above Naguabo, November 4, 1914.

Volucella esuriens (Fabricius), originally described from the West Indies as a *Syrphus*, and since found in the southern United States, Mexico and northern South America, was identified by Herr Victor von Roeder from material collected in Puerto Rico by Dr. Gundlach.

Volucella horvathi Szilady, as determined by Mr. C. T. Greene, is a stout, black and yellow Syrphid fly with pictured wings, found in the Guánica Forest, at Boquerón, and by Dr. Luis F. Martorell on Mona Island.

Volucella pallens Wiedemann, identified for Drs. Stahl and Gundlach as the Cuban *Volucella sexpunctata* Loew by Herr Victor von Roeder, is listed as P. R. 1204 by Mr. R. H. Van Zwaluwenburg. Dr. C. H. Curran (1928-42) noted only specimens from El Yunque, but identified this species from many other Puerto Rican localities as represented in the AMC collection. Its name is most appropriate for it is a distinctly pallid yellow by comparison with more contrastingly marked Syrphids; in Dr. Curran's Key (1930-6) being characterized by "yellowish squamae." It has been repeatedly intercepted on the fruits of orange and grapefruit, and collected by Mr. Thos. H. Jones on flowers of "capá prieto" (*Cordia alliodora*).

Volucella pusilla Macquart, originally described from Cuba, was listed from Puerto Rico by Dr. Gundlach, having been identified by Herr von Roeder.

Volucella tricincta Bigot, as identified by Mr. C. T. Greene, has been intercepted at Mayagüez and Bayamón.

Volucella unipuncta, described by Dr. C. H. Curran (Ann. Ent. Soc. America, **19:** 63, 1926), the type from Desecheo Island and Ensenada,

Puerto Rico, has since been identified by him from Coamo: specimens in the AMC collection.

Eristalis albifrons Wiedemann was first collected in Puerto Rico by Dr. Gundlach, as identified by Herr Victor von Roeder. As *Eristalis albiceps* Macquart, Dr. Alex. Wetmore reports this Syrphid fly as having been eaten by the swallow, martin and redstart. Dr. Curran (1928-12) records it only from El Yunque, but it has been intercepted at Loíza and Pueblo Viejo.

Eristalis atrimanus Loew was first identified from Puerto Rico by Mr. C. T. Greene, from specimens swept from flowers on the beach at Pt. Cangrejos by Dr. Richard T. Cotton, but it had earlier been collected on flowers of "capá prieto" (*Cordia alliodora*) by Mr. Thos. H. Jones, and more recently noted resting on sugar-cane at Yauco. Dr. C. H. Curran (1928-43) records occurrence at Aibonito, and has identified many specimens in the AMC collection from many localities. Its thorax has two silvery bands, its scutellum is yellow and the first abdominal segment has two lateral yellow spots almost as large as the scutellum. When intensive search was being made on flowers of "botoncillo" (*Borreria verticillata*) for *Larra americana* along the north coast of Puerto Rico, this was one of the common Syrphids most often noted, collected at Laguna Tortuguero and Luquillo.

Eristalis cubensis Macquart is listed by Dr. C. H. Curran (1928–43): a single female from Manatí.

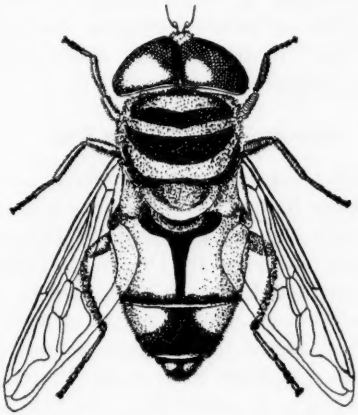
Eristalis hortorum (Fabricius), originally described as a *Syrphus* from the West Indies, and known from St. Thomas and Santo Domingo, was identified by Mr. C. T. Greene from interceptions made at Dorado, Ponce and Mayagüez.

Eristalis pusio Wiedemann, originally described from Brasil, was collected in Puerto Rico by Dr. Gundlach, as identified by Herr Victor von Roeder.

Eristalis vinetorum (Fabricius), originally described as a *Syrphus* from the West Indies and since reported from many neotropical islands and countries, being found as far north as Philadelphia and as far south as Argentina, was identified by Herr Victor von Roeder for Drs. Stahl and Gundlach. In Van Zwaluwenburg's list it is P. R. 96, and Dr. C. H. Curran (1928-42) reports it from many Puerto Rican localities, as well as from the Islands of St. Thomas, St. John and St. Croix. It is one of largest of the local Syrphids, being a much larger and somewhat paler *atrimanus* in appearance, found in the mountains as well as along the coast. Most collections of adults have been made from flowers: those of the yellow caltrop (*Tribulus cistoides*) in Puerta de Tierra early in the morning, and repeatedly from "botoncillo" (*Borreria verticillata*) between 11 AM and 2 PM. Large numbers of rat-tailed maggots found in well-rotted cachaza at Río Piedras

in November 1942 by Mr. Francisco Seín proved to be the immature larval stage of this fly. All of these species of *Eristalis* should be **Tubifera** if the genera of Meigen 1800 are recognized.

Meromacrus cinctus (Drury), described originally as a *Musca* from Jamaica and Santo Domingo, was identified by Herr Victor von Roeder for Puerto Rico from flies collected by Dr. Gundlach. This beautiful large Syrphid, with tufts of bright yellow hair at the base of its wings and behind the head, posteriorly banded across the black thorax, its scutellum and abdomen dull orange, in Van Zwaluwenburg's list is P. R. 616, and in the AMC collection was identified by Dr. C. H. Curran: specimens from Hormigueros, Río Piedras and Jayuya. It rarely occurs along the coast, but was collected by Mr. S. S. Crossman at Aibonito, intercepted at Adjuntas by Mr. R. G. Oakley, and has been repeatedly noted at El Yunque and at El Verde in the Luquillo Mountains.



The Syrphid fly, *Eristalis vinetorum* (Fabricius), four times natural size. (Drawn by Fritz Maximilien.)

Meromacrus pratorum (Fabricius), originally described as a *Syrphus* from the West Indies, was identified from Puerto Rico by Herr Victor von Roeder as collected by Dr. Gundlach, but no recent collection has been made here.

Xylota pachymera Loew, originally described from Cuba, was collected in Puerto Rico by Dr. Gundlach, as determined by Herr Victor von Roeder.

Conopidae: Thick-headed Flies

Conops pictus Fabricius, originally described from the West Indies, was collected in Puerto Rico by Dr. Gundlach, as identified by Victor von

Roeder. It was collected by Messrs R. G. Oakley and A. S. Mills at Isabela, June 26, 1948, as determined by Mr. C. W. Sabrosky. Mr. C. T. Greene identified as a species of *Conops* "near *xanthopareus* Williston" a Conopid fly intercepted at Bayamón.

Physocephala sp. is the determination by Mr. David G. Hall of the yellow and brown wasp-like flies which were found frequenting the flowers of "botoncillo" (*Borreria verticillata*), presumably awaiting opportunity to oviposit on some bee or wasp. A pair has been collected in coitu, resting on a citrus leaf at Isabela, others at Palo Seco, Ceiba and Yabucoa.

Zodion nanellum Loew was collected in Puerto Rico by Dr. Gundlach, as identified by Herr Victor von Roeder.

Dorilaidae (Pipunculidae): Big-headed Flies

Pipunculus regalis, described by Dr. C. H. Curran (1928-43) from a single female from Mayagüez, is "black; stigma brown; antennae black, the third segments yellowish brown, produced downwards into a long, tapering point; abdomen brownish pollinose above, grayish on the sides and base; legs black; length 2.25 mm."

Gasterophilidae: Horse Bots

Gasterophilus nasalis (Linnaeus), as determined by Mr. E. F. Knipling, was first found in Puerto Rico in the alimentary canal of a horse at Río Piedras by Dr. Francisco Menéndez Guillot, at that time official veterinarian for the racetracks, as noted by Dr. W. A. Hoffman, who himself found the bots in a horse from Coamo in 1934. Dr. H. L. Van Volkenberg (1935-23) reported infestations mild in native or acclimated horses, but in "An Annotated Check List of the Parasites of Animals in Puerto Rico" (Circular No. 22, P. R. Agr. Expt. Station, pp. 12, ref. 49. Washington, D. C., January 1939), on p. 4, stated that "the bots are found in about fifty percent of necropsies on the horse, but infestations are mild in character." This confirms Dr. Hoffman's opinion that the horse bot is definitely established in Puerto Rico, and not merely a temporary importation in racehorses from the States.

Hypoderma lineatum (De Villiers), the ox bot or ox warble fly, altho many times found in imported cattle, as first noted by Dr. Gerard Dikmans in the 1925 Report of the Mayagüez Station (1927-23), and repeatedly noted by importers and purchasers of Holstein-Fresian cattle, has not become established in Puerto Rico. This was stated by Dr. H. L. Van Volkenberg (1932-25, 1934-25 & 1935-23) in all his earlier accounts of the insect parasites of cattle in Puerto Rico, but is not mentioned in his Circular No. 22.

Larvaevoridae (Tachinidae): Tachinid Flies

Trichopoda pennipes (Fabricius) was first identified from Puerto Rico by Herr Victor von Roeder as the South American *Trichopoda pyrrhogaster* Wiedemann, and was listed under that name by Van Zwaluwenburg: P. R. 104. This is one of the most attractive and interesting of the Tachinid flies, but one of the least typical. In life the fly holds its posterior legs so that the brush of coarse hairs on the outside of each femora is conspicuous, and its abdomen and relatively enormous squamae are of bright chestnut or dull orange color; the wings dark except on posterior margin, its dark prothorax laterally margined and striped with gold. Mr. Charles E. Wilson, in discussing the "Truck-Crop Insect Pests in the Virgin Islands and Methods of Combating Them", (Virgin Islands Agr. Expt. Station Bulletin No. 4, pp. 35, fig. 24. Washington, D. C., June 21, 1923) noted that "an average of 24.17 percent of adult specimens of *Nezara viridula*, the southern green stink bug, collected at intervals of 14 days throughout the year, were parasitized by *Trichopoda pennipes*. The maximum number parasitized, 93 percent, occurred in January, and the minimum number, 12 percent, occurred in May. The pupal stage of the parasite under laboratory conditions at the station varied from 12 to 16 days. In no case was a parasite reared from nymphs taken in the field, nor were parasitic eggs found on the host in any nymphal stage. Of the various species of Hemiptera collected, only one other species, the stink-bug (*Thyanta perditor*), taken from Lima beans, showed the presence of parasitic eggs." Little wonder that Mr. Wilson considered this Tachinid fly to be the most important natural control for the southern green stink bug in the Virgin Islands, yet in Puerto Rico this fly is by no means abundant, and has been reared from this host only at Isabela. Dr. H. C. Dozier (1926-116) reared this fly from the sweet potato bug (*Corecoris fusca*), but all other records are of collection of adults: on flowers of "botoncillo" (*Borreria verticillata*) at Yabucoa, of coriander (*Coriandrum sativum*) at Isabela, and intercepted at Mayagüez, as determined by Mr. David G. Hall.

Trichopoda flava, described by Victor von Roeder (1885-343) from material collected by Dr. Gundlach in Puerto Rico, is considered by the latter "parece ser propia de la isla."

Trichopoda haitiensis Desvoidy was identified by Dr. C. H. Curran (1928-113) from the Islands of St. Croix and St. Thomas, as well as from Mayagüez, and he gave this name to specimens in the AMC collection from Mayagüez, San Germán, Utuado, Coamo and Río Piedras.

Ectophasiopsis arcuata (Bigot) and *Cylindromyia porteri* (Bréthes), Tachinid flies from Chile, known to be parasitic on Pentatomid bugs, introduced by the Mayagüez Station, as noted in the Report for 1941 (1942-

20), did not survive in Puerto Rico. The first species arrived in poor condition, and the latter, altho active and able to copulate and oviposit in the hosts supplied, did not in fact parasitize any of them.

Hyalomyia chilensis Macquart and *Acaulona peruviana* Townsend, known parasites of the Peruvian cotton stainer, *Dysdercus ruficollis* (L.), were imported by the Mayagüez Station, as noted in the Report for 1942 (1943-15), in the hope that they would parasitize the species of cotton stainer present in Puerto Rico. The first species did not oviposit in nymphs of the local species of *Dysdercus*, and the results of rearing the latter in the laboratory were most meagre. Searching in the field for their released descendents however, Mr. H. K. Plank found a native parasite, which Mr. C. W. Sabrosky (Jour. Washington Academy of Sciences **40** (11): 370. Washington, November 15, 1950) named **Acaulona erythropyga.**

Lydella stabulans var. *grisescens* Rond., an introduced parasite of the larva of the sugar-cane moth-borer, *Diatraea saccharalis*, was not recovered in Puerto Rico, according to the account in the Report of the Mayagüez Station for 1937 (1938-96).

Lydella incompleta Curran, as identified by Dr. J. M. Aldrich, was reared from guava fruits intercepted at Bayamón.

Rhodogyne fuliginosa (Desvoidy), identified as *Gymnosoma filiola* by Herr Victor von Roeder, is listed by Dr. Gundlach from Puerto Rico.

Comyopsis fumata Towsend, as determined by Dr. J. M. Aldrich, was intercepted at Mayagüez.

Acronarista mirabilis Townsend is identified by Dr. C. H. Curran (1928-113) from Puerto Rico: a single female from Orocovis.

Sciasma nebulosa Coquillett is identified by Dr. C. H. Curran (1928-114) from Puerto Rico: specimens from Caguas and Aibonito.

Erycia consistens, as described by Dr. C. H. Curran in his paper of "New West Indian Tachinidae" (American Museum Novitates Number 260, pp. 15, fig. 5. New York, March 19, 1927), on p. 10, from a single male from Coamo, is "related to *celer* Coquillett but the intermediate abdominal segments lack discals and their apices are very broadly shining; length 6.0 mm."

Spathidexia atypica, is described by Dr. C. H. Curran (1927-11) from female flies swept from grass and weeds at Adjuntas, Aibonito and Manatí: "black with whitish pollen, length 4.0 mm."

Spathidexia dunningi (Coquillett) is identified by Dr. C. H. Curran (1928-111) from males from Mayagüez and Manatí.

Clausicellana mitis, as described by Dr. C. H. Curran (1927-12) from a male from Aibonito, is "black with grayish pollen, length 3.0 mm."

Comatacta insularis is described by Dr. C. H. Curran (1927-12) from flies from San Juan and Manatí as being "black, the first two antennal

segments, knees very narrowly, palpi, halteres and obscure areas on the sides of the abdomen reddish; length 5.5 to 6.5 mm."

Prorhynchops errans is described by Dr. C. H. Curran (1927-13) from flies collected by sweeping at Manatí, Arecibo, Caguas and Adjuntas as being "black, with grayish pollen; apical section of proboscis longer than height of head (as illustrated); length 4.5 mm."

Hypostena vanderwulpi (Townsend) originally described as a *Myrothyria* from southern Florida, was collected in Puerto Rico by Mr. Aug. Busck, as reported by Mr. D. W. Coquillett (1900-254).

Tachinophyto floridensis Townsend occurs in Puerto Rico according to Dr. C. H. Curran (1928-111), three females having been collected at Adjuntas.

Plagiprospherysa occidentalis (Wiedemann) was identified by Dr. C. H. Curran (1928-111) from Aibonito.

Mericina ruficauda Curran (1927-6), described from a single male from Arecibo, has very long pteropleural bristles, general color "black; fourth abdominal segments reddish, length 7.5 mm."

Ricosia setigena Curran (1927-5), described from a single female from Aibonito, is "black, the palpi and first two and base of third antennal segment reddish; length 7.0 mm."

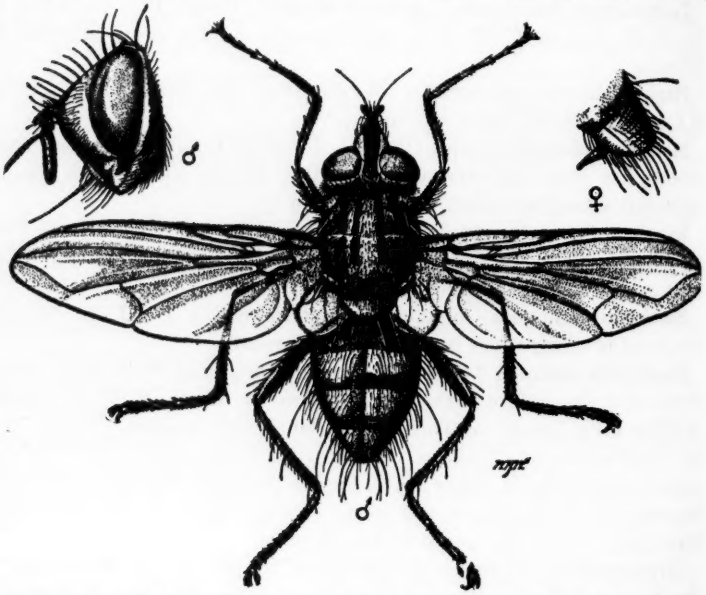
Eucelatoria armigera Coquillett, as determined by Dr. J. M. Aldrich, was found in string beans intercepted at Bayamón.

Eucelatoria australis Townsend, described originally from Peru, has as its synonym *Compsilura oppugnator* described by Mr. W. R. Walton as one of "Four New Species of Tachinidae from North America" (Proc. Ent. Soc. Washington, **16** (2): 93–5. Washington, D. C., June 1914), the type reared by Mr. Thos. H. Jones at Río Piedras from the caterpillar of *Cirphis latiuscula* H. S. feeding on the leaves of sugar-cane. It has since been intercepted in a mango grove at Mayagüez.

Cryptomeigenia aurifacies was described by Mr. W. R. Walton as "A New Species of Tachinidae from Porto Rico" (Proc. Ent. Soc. Washington, 14 (4): 198–200, pl. 1. Washington, D. C., January 10, 1912) from flies reared by Mr. D. L. Van Dine at Hacienda Librada, Central Pagán, Añasco, "from puparia found within the body shells of adult *Lachnosterna* at the roots of coffee," April 29, 1912. So important a parasite of the adults of white grubs did this appear to be that several attempts were made to establish it at Hda. Santa Rita, Guánica, but without apparent success. Indeed, it appears to be restricted to the moister portion of the Island, and later investigations by the British Entomologist, Mr. W. F. Jepson, indicated that hardly more than one percent of the beetles was attacked, even in environments most favorable to this Tachinid fly. Mr. E. G. Smyth (1917-56, 86 to 87, 151) noted that "the number of pupae found

within one dead adult host varies from two to nine, usually four to six. Infested beetles that have died are always found in their burrows in the ground." The adult flies have been collected at Río Piedras, Guaynabo, Pueblo Viejo and Cidra, usually in citrus groves or coffee groves, and not in open cane fields where maximum damage by white grubs occurs.

Eutrixoides jonesii was described by Mr. W. R. Walton as one of some "New North American Tachinidae" (Entomological News, **24** (2): 49-51, pl. 1. Philadelphia, February 1913) from two adults reared by Mr. Thos. H. Jones at Hda. Librada, Central Pagán, Añasco, May 16, 1912,



The endemic Tachinid (Larvaevorid) Parasite of May Beetles in Puerto Rico, *Cryptomeigenia aurifacies* Walton, ten times natural size. (Drawn by W. R. Walton.)

from pupae within dead May beetles. This is apparently the less common of these two Tachinid flies attacking May beetles, and altho occurring generally in the same humid environment, in 1933 was so scarce that it was not found at all by Mr. Walter F. Jepson at any point where he searched for it, either at Añasco, Isabela, Manatí or Cidra.

Lixophaga diatraeae (Townsend), the endemic Tachinid attacking the larvae of the sugar-cane moth-borer, *Diatraea saccharalis* (F.), was first reported from Puerto Rico by Mr. D. L. Van Dine (1912-17) as *Hypostena* sp., and (1913-29 and 1913-254) as *Tachinophyto* sp. *Euzenilliopsis diatraeae* Townsend is the name given by Mr. Harold E. Box in his "Report

F. Martorell found that parasitism at Yabucoa was approximately 65 percent, but during the dry spring of 1948, only 18 percent, while on the dry south coast it reached a maximum of 12 percent in May 1930 at Hda. Potala.

Paratheresia claripalpis (Van der Wulp), the endemic parasite of the larvae of the sugar-cane moth-borer (*Diatraea saccharalis*) in South America, has been repeatedly introduced into Puerto Rico, in the hope that it might at least supplement *Lixophaga diatraeae* in the less humid environments. The work of Mr. S. M. Dohanian in "The Introduction of Parasites of the Sugarcane Borer into Puerto Rico" (Jour. Agr. Univ. P. R., 21 (2): 237–241. Río Piedras, July 1937) rearing the fly in Trinidad and later in Peru, was only the beginning of a series of shipments, as recorded in the Reports of the Mayagüez Station (1938-96, 1939-96, 1940-102, 1942-67), to establish this parasite in Puerto Rico. The latest development

The endemic Tachinid (Larvaevorid) fly, *Lixophaga diatraeae* TT, parasitic on the larvae of *Diatraea saccharalis* (F.), five times natural size. (Drawn by Harry Bradford. After Holloway, Haley & Loftin, Bureau of Entomology, U. S. D. A.)

upon a Trip to Porto Rico, April-July, 1924" (for private circulation) S. Davson & Company, Ltd., pp. 22. Berbice, British Guiana, November 1924). In his account of collections of pupae of the fly and parasitized *Diatraea* larvae from borer dead-hearts between Trujillo Alto and Río Piedras, and between Bayamón and San Patricio, he found a maximum parasitism of 23 percent near Bayamón during May, and not more than 5 percent on Vieques Island. His "Observations upon *Lixophaga diatraeae*, Townsend, a Tachinid Parasite of *Diatraea saccharalis*, in Porto Rico" (Bull. Ent. Research, **19** (1): 1–6, fig. 1, ref. 11. London, August 1928) give the known distribution, outside of Puerto Rico and Vieques, as Cuba and Santo Domingo. It is his opinion that "the efficiency of *Lixophaga* can not be artificially increased (in Puerto Rico) in any way, as it seems that this parasite has reached its maximum effectiveness." When introduced into the cane fields of Florida, however, it may be a very effective parasite, but unfortunately does not survive severe winters, thus fresh introductions must be made each spring. In the spring of 1946, Dr. Luis

was in the introduction of xerophytic races from Itaquaquecetuba, in the State of Sao Paulo, Brasil, such as *P. diatraeae* (Bréthes). This is at most an ecological sub-species, as is shown by Dr. F. I. van Emden (Rev. de Entomologia **20** (1–3): 499–508. Río de Janeiro, August 1949), discussing "The Scientific Name of the Common Tachinid Parasite of *Diatraea* spp. in Central and South America." From the second generation reared in Puerto Rico, releases were made in all parts of the Island of 981 flies, according to Dr. Kenneth A. Bartlett in the "Report of the Puerto Rico Experiment Station 1941" (1942-24).

Metagonistylum minense was described from specimens from Minas Geraes, Brasil and the Bolivian Chaco by Dr. C. H. T. Townsend, with no idea that this extremely curious fly, with immense antennae, might have any economic importance and deserve a name more easily pronounced by ordinary people. Dr. J. G. Myers writes of "The Discovery and Introduction of the Amazon Fly: A New Parasite for Cane-Borers (*Diatraea* spp.)" (Tropical Agriculture, **11** (8): 191-5. Port-of-Spain, 1934) with characteristic charm, relating a success story that meant practical control of the moth-borer in the cane fields of British Guiana. Its success in the swampy cane fields of Demerara, however, by no means ensured its adaptation to quite different environments in other countries, and the first attempt at introduction by Mr. S. M. Dohanian from Trinidad (1937-237) resulted in no recoveries in Puerto Rico. "The Second Introduction of the Amazon Fly from British Guiana into Puerto Rico" (Agr. Notes No. 86, pp. 4. Mayagüez, Nov. 14, 1938) by Dr. Kenneth A. Bartlett was more successful, and in March 1939 a xerophytic strain from Sao Paulo was introduced, reared in Puerto Rico, and up to July 30, 1940, a total of 41,177 flies was liberated at 19 different points in the cane fields of Puerto Rico. Dr. Bartlett, discussing "The Biology of *Metagonistylum minense* Tns., a Parasite of the Sugar-cane Borer" (Bulletin No. 40, P. R. Expt. Station, Mayagüez, pp. 20, fig. 10, ref. 19. Washington, D. C., December 1941), reports that "at the present time the Amazona strain of the fly is considered to be well established in the Añasco Valley region, the Mayagüez, the San Germán Valley region, and on the south coast about Santa Isabel. The highest parasitization found has been 46 percent at Mayagüez, 3 years after the original liberation was made. However, in many collections, the parasitization was 1 percent or less and in many cases it was negative." The latest status examination in the 1941 Report of the Mayaguez Station (1942-67) shows recoveries in cane fields at Cabo Rojo, Santa Isabel, Guayama and Fajardo, but with low parasitizm.

Euphasiopteryx australis Townsend, "A Tachinid Parasite of the Puerto Rican Changa" (Jour. Ec. Ent., **33** (1): 202. Menasha, June 1940), has

twice been introduced into Puerto Rico, but in such small numbers that it could not become established. The pupal stage lasts exactly ten days, giving ample time for airplane shipment, but during dry weather in the Amazon region parasitizm of changa adults is only one or two percent, and even during the rainy season was found not to be more than five percent, at least in nature. In the laboratory of Belém do Pará a maximum of 25 percent of changas was parasitized, but too late in the spring rainy season of 1945 for mass rearing. The puparium is characterized by two prominent knobs terminated by three black warts; the adult is a plump, light yellowish fly with reddish eyes, of nocturnal habits, hiding in the darkest part of the cage during the day but surprisingly active at night.

Epigrimyia townsendi was described by Dr. C. H. Curran (1931-22) from a single female from Isabela Substation as being "related to *robertsoni* Townsend, but with black legs, more broadly shining segmental apices and the third vein bristled as far as the anterior cross-vein; length 5.5 mm." This genus differs from *Stomatodexia* Brauer and Bergenstamm in that "the arista is not short plumose."

Stomatodexia diadema (Wiedemann), another parasite of the larvae of the sugar-cane moth-borer (*Diatraea saccharalis*) in Trinidad and British Guiana, but in environments quite different from those most suitable for the Amazon Fly, was also introduced by Mr. S. M. Dohanian (1937-239) from Demarara into Puerto Rico, but has not since been recovered.

Stomatodexia cothurnata (Wiedemann), listed by Mr. R. H. Van Zwaluwenburg as *Leskia analis* Say (P. R. 5055), reared from *Margaronia hyalinata* L., the cucumber caterpillar, was subsequently identified from Puerto Rico by Dr. C. H. Curran (1928-114): specimens from Mayagüez, Adjuntas and Aibonito.

Leskiopalpus flavipennis (Wiedemann), originally described as a *Dexia* from Brasil, was reared by Dr. Luis F. Martorell from a larva of *Lamprosema* (or *Blepharomastix*) *ebulialis* Guenée feeding on *Heterotrichum cymosum* on El Yunque, the determination of the fly being by Mr. David G. Hall. Flies intercepted at Mayagüez and resting on croton at Bayamón were identified by Dr. J. M. Aldrich as being a species of *Leskiopalpus*, those from a grapefruit grove at Añasco as a species of *Phaenopsis*, those found resting on sour orange at Mayagüez as a species of *Cyrtoneurina*.

Beskia aelops (Walker), described originally from Georgia as a *Tachina*, and since reported from other southern states, Mexico, Brasil, and St. Vincent and Santo Domingo in the West Indies, was first identified by Dr. J. M. Aldrich from material intercepted near San Juan, and Dr. C. H. Curran identified specimens from Río Piedras in the AMC collection as being this species.

Belvosia bifasciata (Fabricius), originally described as a *Musca* from

the West Indies, and known from Brasil and Mexico and the southern and eastern United States as far north as Philadelphia, where it has been reared from large Bombycid caterpillars, was collected in Puerto Rico by Drs. Stahl and Gundlach, as identified by Herr Victor von Roeder. In a devastating outbreak of the sweet potato sphinx caterpillar, *Herse cingulata* (Fabricius), between Arecibo and Aguadilla in December 1918, Messrs. E. G. Smyth and Edgar Nelson found many parasitized by this large black Tachinid fly, three larvae occurring in each large caterpillar. In 1930 specimens were collected at Mayagüez and Yabucoa which Dr. C. H. Curran identified as this species. Its third abdominal segment basally and all of the fourth are densely dull yellowish pollinose.

Belvosia insularis was described by Dr. C. H. Curran (1927-4) from a single female from Orocovis as being "black, the head yellowish, parafrontals darker; frontal vitta rusty reddish; occiput black; length 11.0 mm."

Belvosia luteola was described by Mr. D. W. Coquillett (1900-253) from a type collected by Mr. Aug. Busck on Vieques Island.

Belvosia piurana Townsend, as determined by Dr. C. H. Townsend, collected on flowers at Río Piedras by Mr. Thos. H. Jones, is practically indistinguishable from *B. bifasciata.*

Cylindromyia atra was described as an *Ocyptera* by Herr Victor von Roeder (1885–344) from material collected by Dr. Gundlach in Puerto Rico.

Cylindromyia minor, described by Herr Victor von Roeder (1885-344) as an *Ocyptera* from specimens collected by Dr. Gundlach in Puerto Rico, was identified by Dr. C. H. Curran (1928-114) from Coamo, and others from Boquerón in the AMC collection.

Nemorilla floralis (Fallen), identified by Dr. J. M. Aldrich from flies intercepted at Mayagüez by Mr. A. G. Harley, was reared by Mr. H. K. Plank (1945-27) from caterpillars of the bean leaf-webber, *Hydelepta* (or *Lamprosema*) *indicata* (F.), at Mayagüez.

Nemorilla maculosa Macquart, of which Dr. J. M. Aldrich considers *Exorista pyste* Walker a synonym, was reared from the pupa of the cucumber caterpillar *Margaronia* (or *Diaphania*) *hyalinata* (L.) at Río Piedras by Mr. E. G. Smyth, and from "butterfly nests" of *Tetralopha scabridella* Ragonot on *Inga vera* at Cayey. The general appearance of this little fly is mostly silvery due to extensive whitish pollination.

Euphorocera claripennis (Macquart), as identified by Mr. W. R. Walton, a common parasite of the caterpillars of butterflies in the United States, was reared by Mr. Thos. H. Jones from larvae of the cane looper, *Mocis* (or *Remigia*) *repanda* (F.), at Santa Isabel. As an *Ebenia* it has since been identified from interceptions at Mayagüez. Identified by Mr. C. W. Sabrosky as *Euphorocera tachinomoides* TT, it was reared from the larvae of *Melipotis famelica* (Guenée.) at Yauco in November 1923 by Mr. Francisco Seín.

Phorocera parviteres Aldrich, as identified by Dr. J. M. Aldrich, was reared in large numbers from caterpillars of the cabbage butterfly, *Ascia* (or *Pieris*) *monuste* (L.) at Yauco, and from Geometrid caterpillars, *Melanchroia cephise* Cramer, by Mr. Francisco Seín at Rio Píedras.

Phorocera divisa Aldrich & Webber, originally described from Puerto Rico (Proc. U. S. National Museum, **63** (17): 55. Washington, D. C., 1924), is recognized by Dr. C. H. Curran (1928-109) in a male from St. Croix.

Carcelia amplexa (Coquillett), determined by Dr. J. M. Aldrich as an *Exorista* reared from the larvae of *Ecpantheria icasia* (Cramer) at Río Piedras by Mr. E. G. Smyth, is mentioned by Mr. W. F. Sellers in "The Nearctic Species of Parasitic Flies belonging to *Zenilla* and allied Genera" (Proc. U. S. National Museum, **93** (3157): 1-108. Washington, D. C., 1943) on page 63.

Carcelia flavirostris (Van der Wulp), described originally as an *Exorista* from Mexico, and also found in the Southern United States, is identified by Mr. W. F. Sellers (1943-60) as the Tachinid fly reared by Mr. R. H. Van Zwaluwenburg from the "plumilla" caterpillar of *Megalopyge krugii* (Dewitz), and by Dr. C. W. Hooker from a larva, presumably of *Mesocondyla concordalis* (Hübner), feeding on the leaves of a calabash tree (*Crescentia cujete*) at Mayagüez. More recently, as identified by Mr. C. W. Sabrosky, it was reared from a mummied woolly-bear caterpillar of *Ecpantheria icasia* (Cramer) at Cidra, some of the puparia being parasitized by the Chalcid wasp, *Brachymeria incerta* (Cresson).

Exorista tessellata was described by Herr Victor von Roeder (1885-345) from material collected in Puerto Rico by Dr. Gundlach.

Achaetoneura aletiae (Riley), originally described as a *Tachina* reared from the cotton leafworm, and found thruout the United States and southern Canada, was identified by Dr. J. M. Aldrich from Puerto Rico: reared by Mr. Francisco Seín from a chrysalis which he found at Lares on *Inga laurina*. From the caterpillars of *Alabama argillacea* Hübner in Puerto Rico, no Tachinid fly has been reared to date.

Achaetoneura archippivora (Williston) has been reared from many kinds of butterfly larvae in the United States. In Puerto Rico, as identified by Mr. W. R. Walton, it has been reared from the caterpillars of the southern grassworm, *Laphygma frugiperda* (Abbot & Smith), was first reported by Mr. D. L. Van Dine (1913-31 and 1913-257), and subsequently by Mr. Thos. H. Jones (1913-235), from many rearings at Río Piedras, and others at Mameyes, Arecibo and Sabana Grande. In November 1937 it was reared from tobacco cutworms, *Feltia subterranea* (F.) attacking cotton seedlings at Boquerón, as identified by Mr. C. W. Sabrosky.

Achaetoneura bigeminata, described by Dr. C. H. Curran (1927-9) as a *Frontina* from three males from Adjuntas, is "elongate, fairly slender;

black, including the palpi; thorax cinereous pollinose, with four broad black vittae; length, 9.0 mm." and has recently been intercepted at Vega Alta.

Achaetoneura insularis Brauer & Bergenstamm, originally described as a *Frontina* from St. Thomas, was listed by Dr. C. H. Curran (1928-110) from Orocovis, and identified from Mayagüez and many localities in all parts of Puerto Rico: specimens in the AMC collection.

Achaetoneura rufifrons, described as a *Frontina* from Puerto Rico by Herr Victor Roeder (1885-346) was collected by Dr. Gundlach and listed by him.

Argyrophylax albincisa (Wiedemann), originally described as a *Tachina* from St. Thomas, was first reported from Puerto Rico as a *Sturmia* by Dr. Richard T. Cotton (1917-113), having been reared by him from the "pegapega" of tobacco: *Psara periusalis* (Walker). It attacks other kinds of Pyralid caterpillars, having been reared from *Zinckenia perspectalis* (Fabricius) on amaranthus by Mr. E. G. Smyth; from *Hydelepta indicata* (Fabricius) on cowpeas by Mr. Thos. H. Jones; from *Mesocondyla concordalis* (Hübner) on "roble" (*Tabebaia pallida*), first by Mr. Jones, and later by Dr. Luis F. Martorell (1940–19), all of these determinations of the fly being by Dr. J. M. Aldrich. It is really a very common insect, having been repeatedly intercepted from all parts of the Island, altho Dr. C. H. Curran (1928-110) lists only a single female from Mayagüez.

Sturmia cubaecola (Jaennicke), as identified by Dr. Maurice T. James, is listed by Mr. H. K. Plank in the 1944 Report of the Mayagüez Station (1945-27) as a parasite on the bean leaf-webber, *Hydelepta indicata* (Fabricius), attacking soybeans. This material has been re-determined by Mr. C. W. Sabrosky as *Argyrophylax albincisa.*

Zygosturmia sp. was the identification by Dr. J. M. Aldrich of the Tachinid flies reared by Mr. Thos. H. Jones from a sphinx caterpillar on *Cordia,* many maggots emerging from a single caterpillar's body.

Anacamptomyia americana, as described by Dr. C. H. Curran (1937-8), "is black, the palpi, scutellum mostly and the halteres reddish; thorax yellowish gray pollinose, with five black vittae, the median and lateral ones broad, the others slender; length 7.0 mm.," the type a single female from Mayagüez, of which an illustration of the profile of the head is given.

Ormia punctata Desvoidy was first identified by Herr Victor von Roeder from Puerto Rico, and thus listed by Dr. Gunlach as a Muscid fly. Dr. J. M. Aldrich identified specimens from Pt. Cangrejos, and another from Aibonito collected by Dr. Richard T. Cotton. Dr. C. H. Curran (1931-23) gives the name *dominicana* Townsend to a single female collected by Prof. W. T. M. Forbes at Coamo, but admits that "it is possible that the specimen before me is not *dominicana.*" These flies are "all rusty yellow-

ish in color (quite similar in general appearance to the changa parasite of Brasil, *Euphasiopteryx australis* TT.), rarely with darker markings; readily recognized by the greatly swollen medianly sulcate prosternum."

Linnaemyia fulvicauda was described by Mr. W. R. Walton (1914-93) from material reared by Mr. Thos. H. Jones from larvae of the sugar-cane looper caterpillar, *Mocis* (or *Remigia*) *repanda* (Fabricius), of which additional specimens were obtained in the same year (1912) at Cayey, and by Mr. S. S. Crossman at Aibonito. Dr. C. H. Curran (1928-108) also recognised this fly: a single male from Aibonito.

Leschenaultia juriniodes (Townsend) originally described from Jamaica, was identified by Dr. J. M. Aldrich from unlabeled specimens presumably collected in Puerto Rico. These flies have extremely hairy black abdomens, but the thorax is grey with whitish pollinose.

Leschenaultia leucophrys (Wiedemann), originally described as a *Tachina* from Brasil, and reported from the greater Antilles, Central America, Mexico and the eastern United States as far north as Franconia, New Hampshire, is first listed from Puerto Rico by Dr. Gundlach. Dr. J. M. Aldrich identifies as this species unlabeled specimens which may be what Mr. E. G. Smyth reared from a dead mouse at Río Piedras, and from which heavy **Parachaeta bicolar** Macquart was also reared.

Winthemia okefenokeensis Smith is listed by Dr. C. H. Curran (1928-108) from Cuba and Jamaica, and from Manatí and Caguas, Puerto Rico.

Winthemia quadripustulata (Fabricius), originally described from Europe as a *Tachina*, and known thruout the United States east of the Rocky Mountains, was identified by Dr. J. M. Aldrich from material reared by Mr. Thos. H. Jones from the pupa of a Noctuid, possibly *Cirphis latiuscula* (H. S.), on sugar-cane at Ponce.

Winthemia sexualis was described by Dr. C. H. Curran (1927-7) from males from Arecibo and Adjuntas as being "rather similar to *okefinokensis* Smith but the abdominal pollen is much thinner and leaves wide, shining segmental fasciae, and the front tarsi are simple; it bears a large ventral sexual patch on the third tergite composed of dense brownish black hair; length 7 to 8 mm."

Voria ruralis (Fallen), as identified by Dr. Maurice T. James, is listed by Mr. H. K. Plank in the 1944 Report of the Mayaguez Station (1945-27) as a parasite of the velvetbean caterpillar, *Anticarsia gemmatilis* (Hübner), on soybeans. From the same host at Río Piedras, Mr. Thos. H. Jones reared flies which Dr. J. M. Aldrich identified as a species of **Gonia**.

Gonia crassicornis (Fabricius), originally described as a *Musca* from the West Indies, was identified by Dr. J. M. Aldrich for Mr. D. L. Van Dine (1913-31 and 1913-257) as a parasite on the southern grassworm, *Laphygma frugiperda* (Abbot & Smith), and was listed by Mr. Thos. H.

Jones (1913-235 and 1922-47). It has also been reared from a cocoon of *Xylomiges eridania* (Cramer) intercepted on potato at Cidra, and occurs in all parts of the Island, adults having been intercepted at Mayagüez and Guánica, and, as identified by Mr. C. W. Sabrosky, taken from flowers of *Borreria verticillata* at Vega Baja. As *Gonia angusta* Macquart, this fly is listed by Van Zwaluwenburg as P. R. 103: from *Lachnosterna* spp., presumably reared from dead May beetles, and not a parasite. *Gonia texensis* Reinhard, as identified by Dr. C. H. Curran (1928-107) from Jamaica, and from Manatí and Coamo in Puerto Rico, is considered a synonym by Mr. C. W. Sabrosky.

Gonia pallens Wiedemann, originally described from Brasil, was reported from Puerto Rico by Herr Victor von Roeder, but listed by Dr. Gundlach as *Gonia chilensis* Macquart. This fly occurs as far south as Patagonia, and is reported in all of the Greater Antilles and in Mexico. Mr. E. G. Smyth reared this "large grey and red-brown Tachinid" from the pupa of *Xylomiges sunia* (Guenée), at Río Piedras, the fly having been determined by Dr. J. M. Aldrich.

Peleteria robusta (Wiedemann), originally described as a *Tachina* from South America, and occurring as far north as Canada, was first collected in Puerto Rico by Dr. Gundlach and reported by him and Herr Victor von Roeder as a *Echinomyia*.

Archytas analis (Fabricius), originally described as a *Tachina* from South America, and definitely reported from St. Vincent, Santo Domingo and Jamaica, as well as widely distributed in the United States and Canada, was identified from Puerto Rico by Dr. J. M. Aldrich for Mr. Thos. H. Jones, who reared it from a cutworm on tobacco, presumably *Prodenia ornithogalli* (Guenée), at Aibonito.

Archytas antillicola was described by Dr. C. H. Curran (1927-2) from an extensive series of flies from all parts of Puerto Rico, as well as others from Jamaica and British Guiana. It is "black, antennae partly and the palpi apically, reddish; face and cheeks yellow, length 11.5 to 13.0 mm.," and of it Dr. Curran identifies numerous specimens in AMC collection: from Yabucoa, Río Piedras, Coamo, Hormigueros and Mayagüez. It has also been intercepted on El Yunque.

Archytas basifulva (Walker), originally described as an *Echinomyia* from Jamaica, was first collected in Puerto Rico by Mr. Aug. Busck, as reported by Mr. D. W. Coquillett (1900-253), and is in Van Zwaluwenburg's list as P. R. 97. Dr. C. H. Curran (1928-106) identified this fly from Coamo, and in the AMC collection, specimens from Mayagüez, Hormigueros, Tortuguero Lagoon and Yabucoa. Mr. David G. Hall identified as this species the flies which Dr. Luis F. Martorell reared from the southern armyworm, *Laphygma frugiperda* (Abbot & Smith), feeding on alfalfa at Tallaboa in November 1940.

Archytas piliventris (Van der Wulp), originally described as an *Echinomyia* from the Argentine and Mexico, was first identified from Puerto Rico by Mr. W. R. Walton as a parasite of the southern grassworm, *Laphygma frugiperda* (Abbot & Smith), feeding on malojillo and sugarcane at Río Piedras, as reported by Mr. D. L. Van Dine (1913-31, 1913-257) and Mr. Thos. H. Jones (1913-235, 1922-47). Dr. C. H. Curran (1928-107) identified this fly from St. Thomas, and from Coamo and Mayagüez in Puerto Rico, as well as specimens in the AMC collection from many other localities in all parts of the Island. As identified by Mr. C. W. Sabrosky, it was noted by Dr. Luis F. Martorell feeding at flowers of *Borreria verticillata* at Guajataca Reservoir.

Archytas seminigra (Wiedemann), originally described as a *Tachina* from Brasil, was reported as *Jurinia analis* Macquart from Puerto Rico by Herr Victor von Roeder, and thus listed by Dr. Gundlach.

Archytas incerta (Macquart), as identified by Dr. J. M. Aldrich, has been reared from caterpillars intercepted on beets at Vega Baja and on peas at Cidra.

Antillicolla auriceps was described by Dr. C. H. Curran (1927-1) from a single female from Adjuntas as being "black, the face, palpi, antennae and apex of the abdomen, reddish; head golden pollinose; wing veins bordered with brown; length, 7.0 mm.," accompanying the description with an illustration of the profile of the head.

Dinera sp. nov. was the determination by Dr. J. M. Aldrich of a fly intercepted in an orange grove at Mayagüez by Mr. A. G. Harley.

Opsodexia cruciata Reinhard, as identified by Dr. J. M. Aldrich, was intercepted in a mango grove at Mayagüez by Mr. A. G. Harley.

Rhynchodexia sororia Williston, originally described from St. Vincent, is recognized by Dr. C. H. Curran (1928-113) from Puerto Rico in an abundance of specimens from San Juan and Santurce to Maricao. He (1931-23) suggests "that this name should be replaced by *rufianalis* van der Wulp."

Rhynchodexia rufianalis van der Wulp was first collected in Puerto Rico by Mr. Aug. Busck, as reported by Mr. D. W. Coquillett (1900-254). Adults identified by Dr. J. M. Aldrich have since been collected in Isabela Grove, Pt. Salinas, and by Dr. Richard T. Cotton swept from flowers at Pt. Cangrejos.

Dexia strenua (Desvoidy), originally described from Santo Domingo as a *Zelia*, was identified from Puerto Rico by Herr Victor von Roeder, and listed by Dr. Gundlach.

Sarcophagidae: Flesh Flies

Sarcophaga lambens Wiedemann was originally described from the West Indies, and first collected in Puerto Rico by Dr. Gundlach, who listed it

under this name as identified by Herr Victor von Roeder. It was collected by Mr. Aug. Busck, as reported by Mr. D. W. Coquillett (1900-254), but most later records are under the name *Sarcophaga sternodontis* Townsend, given by Dr. J. M. Aldrich in his book "Sarcophaga and Allies in North America" (Thomas Say Foundation, pp. 342, pl. 16. Lafayette, Indiana, 1916) on page 267. *Sarcodexia sternodontis* was described by Dr. C. H. T. Townsend from Jamaica, reared from a dead Cerambycid beetle, and from a dead scorpion. As a *Sarcophaga* in Puerto Rico it was reported reared from the pupae of the cotton leaf caterpillar, *Alabama argillacea* (Hübner), at Hatillo (Wolcott 1924-56), and from white grubs and the pupae of the sugar-cane looper caterpillar, *Mocis* (or *Remigia*) *repanda* (Fabricius), by Jones & Wolcott (1922-49). The long list of localities noted by Dr. C. H. Curran (1928-99) gives some indication of the abundance of this particular Scarcophagid fly, as in the collection at Río Piedras reared adults are more numerous than all other members of the family. In addition to the hosts mentioned it has been reared from dead May beetles, from dead spiders, from dead tobacco hornworms and other sphinx caterpillars and moths, from southern grassworm pupae, from dead changa, from dead grasshoppers and from dead cockroach. Altho it is possible that the pupae of the cotton leafworm and of the southern grassworm were still alive when attacked by this fly, it is much more probable that they were already dead, for the normal habit of the ovipositing female is to lay her eggs only on dead invertebrates. Many of the rearing records are accidental, so far as the entomologist is concerned, for if his large insects are not placed in a screened cage for drying, the female fly will discover his carelessness, and a few days later maggots will drop from the body of the insect, having devoured all the soft parts within its horny skeleton, and left the specimen in really much better shape for the collection than if it contained all its internal organs. Growth and development of the maggots are necessarily very rapid, for their food supply is limited in amount and decaying rapidly. The adult flies have four silvery white pollinose stripes on the thorax, and interrupted and less dense pollinose bands on the abdomen, and in size may be somewhat smaller or considerably larger than houseflies, depending upon the nourishment available to the maggots. In San Juan maggots have been intercepted feeding on yeast, and reared to adult on this medium alone. Dr. Maurice T. James, discussing this representative of "The Flies that cause Myiasis in Man" (U. S. D. A. Misc. Publication No. 631, pp. 175, fig. 98, ref. 160. Washington, D. C., 1947), on page 52 states that "the larvae breed in various substances, including carrion and excrement; they have been found to be parasitic on a large number of insects." On the basis of our experience in Puerto Rico the latter statement can hardly be considered correct and

should read that they are scavengers on dead insects. As indicated by Dr. James, the distribution of this fly includes the southeastern United States, the neotropical region with specific records for many of the Lesser Antilles extending to Paraguay and Agrentina in South America.

Sarcophaga amoena Aldrich, originally described from Dominica, B. W. I., has been reared from an injured snail from Lares, and adults collected from malojillo or resting on corn leaves at Río Piedras, as identified by Dr. J. M. Aldrich. The male is 9 mm. long; the female 6.5 mm.

Sarcophaga alcedo Aldrich, as determined by Mr. David C. Hall, was found by Dr. Kenneth A. Bartlett occurring in the shipping cages in which adults of *Canthon pilularius* (L.) were sent from Texas. Reporting on "The Dung Rolling Beetle as a Host of a Sarcophagid Parasite" (Jour. Ec. Ent., **32** (1): 150. Menasha, February 1939), he found that "the adult flies deposit living larvae," which "are able to penetrate the integument of the (living) beetle at any point, but the majority enter through the thinner chitinized portions of the abdomen," attaining full size in from three to seven days. *Copris incertus* Say was also successfully parasitized.

Sarcophaga australis Aldrich, as identified by its describer, has been intercepted in Isabela Grove, Palo Seco.

Sarcophaga bakeri Aldrich, originally described from Cuba, was first identified from Puerto Rico by its describer from material collected by Mr. R. H. Van Zwaluwenburg at Mayagüez, as listed in "Insectae Portoricensis" (1923-224), and subsequently has been intercepted at Loíza, San Juan and Barceloneta. Dr. C. H. Curran (1928-99) identifies many specimens from Puerto Rico, from El Yunque to Ensenada, as well as from Mona Island and St. Thomas.

Sarcophaga capitata was described by Dr. J. M. Aldrich (1916-209), the types from Mayagüez and Arecibo, as "like *amoena*, but has head-pollen and beard quite deep yellow, length of male 15 mm.; of female 11 mm.," and quite the largest of any Puerto Rican Sarcophagid. Dr. C. H. Curran (1928-98) identifies this fly from additional localities and in the AMC collection as far east as San Juan and Río Piedras.

Sarcophaga culminata was described by Dr. J. M. Aldrich (1916-289), the type from Mayagüez: a single male. It is by no means rare in Puerto Rico, however, for it has since been intercepted on El Yunque, and Dr. C. H. Curran (1928-99) identifies specimens from there, Naguabo, San Juan, Adjuntas and Jayuya.

Sarcophaga currani Hall, as determined by Mr. D. G. Hall, was found in Viejo Lirio cave, on Mona Island by Dr. Luis F. Martorell. It was originally described from Cuba.

Sarcophaga globulus Aldrich, originally described from Cuba, is listed

from Mona Island and Puerto Rico by Dr. C. H. Curran (1928-100) as in the sub-genus *Helicobia*, with specimens from Naguabo, Manatí, Aibonito, Adjuntas and Orocovis.

Sarcophaga latisetosa (Parker) was identified from Puerto Rico by Dr. C. H. Curran (1928-100) at many localities from San Juan to Ensenada, and in the mountains at Aibonito.

Sarcophaga morionella Aldrich, as determined by its describer, has been intercepted at Bayamón, and repeatedly in orange or mango groves at Mayagüez, and in a coffee grove at Maricao.

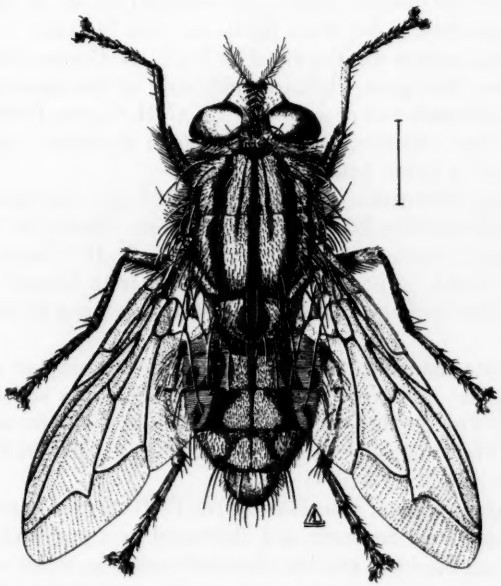
Sarcophaga peltata was described by Dr. J. M. Aldrich (1916-216), the type from Mayagüez, (R. H. Van Zwaluwenburg) and Naguabo, others from Cuba, Florida and the Bahamas. It is very common in Puerto Rico, Dr. C. H. Curran (1928-98) identifying it from many other localities and in the AMC collection from Las Marías and Maricao to Ponce, Yauco and Cabo Rojo. It has repeatedly been collected or intercepted in grapefruit groves, intercepted in decaying cucumbers at Bayamón, and found in trees of "jobo" (*Spondias mombin*) at Río Piedras when the fruit is so ripe as to be falling from the tree.

Sarcophaga plinthopyga Wiedemann was originally described from St. Thomas, but it has a very extensive distribution from Nova Scotia in Canada, thruout the western United States and in the neotropics as far south as Sao Paulo and west as the Galapagos. It was identified from Puerto Rico by Herr Victor von Roeder, and listed by him and Dr. Gundlach, and collected by Mr. August Busck as indicated by Mr. D. W. Coquillett, but apparently is not very common, for Dr. J. M. Aldrich (1916-268) as *Sarcophaga robusta* Aldrich, notes but a single specimen from Mayagüez, and Dr. C. H. Curran (1931-22) a single male from Vieques. The AMC collection contains numerous specimens from Mayaguez and a few from Añasco, Utuado, Río Piedras and Yabucoa. Dr. Luis F. Martorell collected it on flowers of "botoncillo" (*Borreria verticellata*) at Isabela, as identified by Mr. David G. Hall. Dr. Maurice T. James (1947-51) reproduces an illustration of this fly, noting that its "larvae differ in their feeding habits and are commonly found on carcases or as parasities in the bodies of insects. However, they frequently attack old and festered sores in man and animals, or invade diseased body opening." In Puerto Rico these flies do not show the "notorious myiasis-producing" habits reported from Trinidad and British Guiana.

Sarcophaga (Helicobia) quadrisetosa Coquillett is listed by Dr. Ralph R. Parker in his "Sarcophagidae of New England" (Proc. Boston Soc. Natural History, **35** (1)- 1-77, pl. 8. Boston, 1914) on page 60 as occurring in Puerto Rico.

Sarcophaga (Helicobia) surrubea Van der Wulp, described originally from Mexico, is identified by Dr. C. H. Curran (1928-101) from the Virgin Islands of St. Croix, St. John and St. Thomas, as well as from numerous localities in Puerto Rico from El Yunque to Ensenada.

Sarcophaga (Helicobia) rapax Walker, as identified by Dr. M. T. James, was reared from a dead rhinoceros beetle, *Strataegus barbigerus* Chapin, from Mona Island. As *Sarcophaga helicis* Townsend, "one of the commonest North American species" according to Dr. Aldrich (1916-159), it was collected in Puerto Rico by Mr. August Busck, as reported by Mr. D. W.



Adult male of *Sarcophaga plinthopyga* Wiedemann, ten to fifteen times natural size. (Drawn by Arthur D. Cushman. After James, U. S. D. A.)

Coquillett (1900-255), and is reported from numerous Puerto Rican localities by Dr. C. H. Curran (1928-101), as well as from Mona Island. Mr. Thos. H. Jones (and Wolcott 1922-49) reared this fly from a caterpillar of the sugar-cane looper, *Mocis* (or *Remigia*) *repanda* (Fabricius), feeding on grass at La Plata in February 1912, and apparently it is a true parasite.

Sarcophaga taurus Aldrich, originally described from Naguabo, has since been intercepted at San Juan. The male is 14.0 mm. long, or almost as large as *Sarcophaga capitata*.

Sarcophagula occidua (Fabricius), originally described as a *Musca* from the West Indies, was first collected in Puerto Rico by Mr. August Busck, as reported by Mr. D. W. Coquillett (1900-254), and is listed by Dr. C. H. Curran (1928-101) from the Virgin Islands of St. Croix, St. John and St. Thomas, from numerous Puerto Rican localities from Naguabo and Fajardo to Adjuntas and Mayagüez, and from Mona Island. It has been repeatedly intercepted in all parts of the Island, resting on non-significant hosts varying from the hedge of "café de la India" (*Chalcas exotica*) around the Post Office Building in San Juan to rotten cucumbers at Bayamón. Mr. Thos. H. Jones collected fourteen of these little grey flies on cattle dung at Río Piedras, which were identified by Mr. F. Knab as *Sarcophagula imbecilla* Van der Wulp (P. R. Acc. No. 745-14).

Sarcofahrtia capitata was described by Dr. C. H. Curran (1928-96) from male flies from Mayagüez, distinguishable only by the figured genitalia.

Johnsonia bivittata was described by Dr. C. H. Curran (1928-95) from a single male from Aibonito, "having the fourth abdominal segment black on apical third or more; length 3.75 mm."

Harpagopyga diversipes, originally described as a *Sarcophaga* by Mr. D. W. Coquillett (1900-255) from a single male collected in Puerto Rico by Mr. August Busck, was identified by Dr. C. H. Curran (1928-101) from Mona Island, in addition to a specimen from Coamo. Dr. J. W. Aldrich has identified as a new species of *Harpagopyga* a fly intercepted at Arecibo.

Sarothromyia femoralis (Schiner), described originally as a *Sarcophila* from Brasil, and previously known from the Bahamas and Florida, was identified by Dr. C. H. Curran (1928-101) from Santurce and Arecibo. Dr. Luis F. Martorell collected one of these flies at light on Mona Island, as determined by Mr. David G. Hall.

Sarcophagina candida, described by Dr. C. H. Curran (1928-102) from a single female from Santurce and illustrated by a profile of the head, is "8.5 mm. long; blackish; grayish-white pollinose, the pollen with a strong golden yellow tinge in some views; mesonotum with three darker vittae."

Pachyophthalmus floridensis (Townsend), originally described as a *Sarcomacronychia*, and previously known from the southern United States, is identified by Dr. C. H. Curran (1928-103) from Haiti and Jamaica, and from San Juan, Puerto Rico.

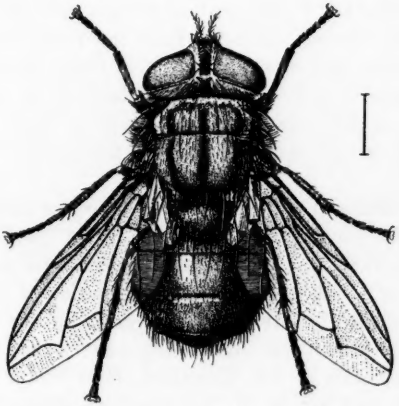
Senotainia rubriventris Macquart, originally described from Texas, but occurring thruout the United States, is identified by Dr. C. H. Curran (1928-103) from Mona Island, and from Ensenada, Mayagüez, Coamo and Caguas in Puerto Rico.

Scenetes cardini are described by Mr. J. R. Malloch as "A New Genus and Species of Muscidae from Puerto Rico" (Proc. Ent. Soc. Washington,

38 (1): 9-10. Washington, D. C., January 1936), the type from Cuba, others reared from guava at Mayagüez by Mr. A. G. Harley and Dr. K. A. Bartlett. Mr. Francisco Seín noted the creamy white maggots with two black dots on the hind end in rotten oranges at Mayagüez in December 1925, and reared adults which were determined by Mr. C. W. Sabrosky.

Graphomya stipata Walker, as identified by Dr. J. M. Aldrich, was intercepted on mango blossoms at Mayagüez.

Graphomya maculata Scopoli, as identified by Dr. J. M. Aldrich, was intercepted at Ponce by Mr. R. G. Oakley.



Adult female of the Primary Screwworm, *Callitroga americana* (Cushing & Patton), eight times natural size. (Drawn by Arthur D. Cushman. After James, U. S. D. A.)

Calliphoridae: Blow Flies

The book entitled "The Blowflies of North America" (pp. 477, pl. 46, Volume 4 of the Thomas Say Foundation. Baltimore, January 1948) by Mr. David G. Hall is a systematic account of the Calliphoridae, giving extensive data on life-history and habits, descriptions, bibliography and up-to-date synonymy, with distribution records for the species found in the West Indies and often referring more particularly to Puerto Rico.

Callitroga americana (Cushing and Patton), the primary screwworm, was not recognized as distinct from *Callitroga macellaria* (Fabricius), the secondary or common screwworm fly, until 1933, and it is quite possible that the early records of the latter by Dr. H. L. Van Volkenberg (1932–25) refer to the former species. What was originally described as *Cochliomyia americana* Cushing and Patton is a bluish or bluish-green fly, with "black hair on the lower as well as on the upper part of the parafrontalia," according to

Dr. M. T. James (1947-63). Under this name, Dr. H. L. Van Volkenberg in his paper on the "Parasites and Parasitic Diseases of Cattle in Puerto Rico" (P. R. Expt. Station Bulletin No. 36, fig. 4. Washington, D. C., October 1934) gives the life-history and control notes, and in his "Annotated Check List of the Parasites of Animals in Puerto Rico" (P. R. Expt. Station Circular No. 22 pp. 12, ref. 49. Washington, D. C., January 1939) states that "the fly, as determined by Mr. Emory C. Cushing is common and widespread, but owing to prompt treatments of wounds, it does not cause much damage to livestock." Dr. H. L. Dozier reared this fly from maggots in wounds in ox at Mayagüez and Guánica in 1935.

Callitroga aldrichi (Del Ponte), as *Cochliomyia laniaria* Aldrich was identified by Dr. C. H. Curran (1928–92) from the Virgin Islands of St. John and St. Thomas, from Naguabo and Jayuya in Puerto Rico, and from Mona Island. It has since been found on Mona Island by Dr. Luis F. Martorell, who collected it, as determined by Mr. David G. Hall, on the flowers of "abejuelo" (*Colubrina ferruginosa*). It was intercepted by Mayagüez by Mr. A. G. Harley.

Callitroga macellaria (Fabricius) the secondary or common screwworm, is a greenbodied fly, according to Dr. M. T. James (1947-65), "with a predominantly orange head; the hair of the lower half of the parafrontals yellow and of fine texture." All except one of the specimens in the Río Piedras collection, as confirmed by Mr. C. W. Sabrosky, appear to be this species. According to the records it was this species, called a *Chrysomyia*, which was listed from Puerto Rico by Dr. Gundlach, Herr Victor von Roeder, Mr. D. W. Coquillett, and Mr. R. H. Van Zwaluwenburg. As a *Cochliomyia* it is recorded by Mr. J. A. Stevenson (1918–150) and by Miss Vera K. Charles (1941–720) as host of the fungus *Cordyceps dipterigena* Berk. & Br., and identified by Dr. C. H. Curran (1928–92) from the Virgin Islands of St. Croix, St. John and St. Thomas, from numerous localities in Puerto Rico, and from Mona Island. Before fish were iced on Mona Island the fishermen claimed that this fly was so abundant and troublesome as to prevent their being dried on the beach. Dr. Richard T. Cotton reports these flies "attracted in huge swarms to a tank of gasoline that was being pumped out" at Río Piedras in November 1917, and individuals have repeatedly been collected resting on corn leaves or in grapefruit groves. According to Dr. James (1947–65), it is "primarily a scavenger and may be very abundant in carrion; the adult feeds on a variety of food, from garbage refuse to the nectar of flowers."

Callitroga minima (Shannon) was described as a *Cochliomyia* from the Dominican Republic, and, as identified by Mr. C. W. Sabrosky, was collected at Aibonito, Puerto Rico by Mr. S. S. Crossman, July 1, 1913.

Phaenicia purpurescens (Walker) has been identified by Mr. C. W. Sabrosky from Puerto Rico.

Phaenicia cluvia (Walker) was found by Mr. Raymond C. Shannon in his "Synopsis of American Calliphoridae" (Proc. Ent. Soc. Washington, **28** (6): 115–139. Washington, D. C., June 1926) to have as a synonym *Lucilia pilatei* Hough, which he had recorded from Fajardo, Puerto Rico in his redescription in "Nearctic Calliphorida, Luciliini" (Insecutor Inscitiae Menstruus, **12** (4–6): 67–81. Washington, D. C., April–June, 1924). It is "a bright green species with post margin of second tergite dark blue, without much trace of silvery pollenosity; size variable."

Phaenicia eximia (Wiedemann) as identified by Mr. David G. Hall, was collected on Mona Island by Dr. Luis F. Martorell. According to Mr. Hall (1948–239), this "blue-green species with the abdomen highly polished" is what Herr Victor von Roeder (1885–347) re-described from material collected by Dr. Gundlach in Puerto Rico under the name of *Lucilia ruficornis* Macquart. It was also listed from Puerto Rico by Mr. D. W. Coquillett, and is known to occur in St. Vincent as well as in the southeastern United States as indicated by Mr. Shannon. *Lucilia hirtiforceps* Shannon, originally described from Panama, Costa Rica and Mexico, identified by Dr. C. H. Curran (1928–93) from Desecheo Island and Mayagüez, Puerto Rico, is aother synonym for *eximia*, according to Mr. Hall. Still another synonym is the *Musca ochricornis* Wiedemann, originally described from Brasil and known also from Cuba. Under this name Herr Victor von Roeder identified material collected by Drs. Stahl and Gundlach in Puerto Rico. As a *Pyrellia* it was noted by Mr. D. W. Coquillett as having been collected in Puerto Rico by Mr. Aug. Busck, and Dr. C. H. Curran (1928–91), altho admtting only having "seen it from adjacent islands," subsequently identified many specimens in the AMC collection from all parts of Puerto Rico. Dr. Richard T. Cotton collected specimens, identified by Dr. Aldrich as *Pyrellia ochricornis* Wd., from near dung at Río Piedras, and in a citrus grove at Vega Alta, but the largest number he saw was "in a tub half full of water and decaying vegetation in which large white maggots were wiggling vigorously. Some of the adults that had emerged had been unable to get out of the water and were drowned."

Phaenicia rica (Shannon) is "a medium-sized greenish-blue species with the habitus of *eximia*" according to Mr. Hall (1948–257). Originally described as a *Lucilia* from Antigua, B. W. I., it was identified by Dr. C. H. Curran (1928–93) from specimens collected at Mayagüez, Arecibo and Naranjito, Puerto Rico. It is probable that the *Somomyia semiviolacae* described by J. Bigot from Puerto Rico in "Dipteres noveaux ou peu connus" (Annales Ent. Soc. France, No. **5**, pt. 7, p. 46. Paris, 1877) is a syno-

nym, but the type is in too poor a state of preservation for accurate determination.

The record of *Lucilia caesar* (Linnaeus) given by Mr. Coquillett is presumably in error, for this common European green bottle fly does not occur in North America or the West Indies.

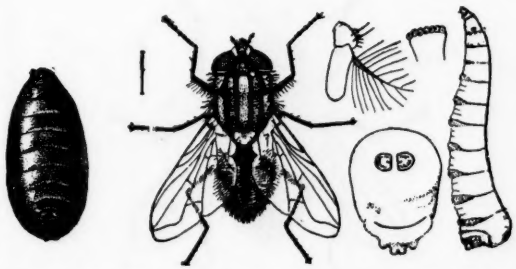
Muscidae: House Flies or "Muscids."

Morellia scapulata (Bigot), originally described as *Pyrellia* from Haiti and Mexico, and thus identified by Dr. J. M. Aldrich, was first noted in abundance in Puerto Rico in August 1921 at Río Piedras, when many of these blue bottle flies were noted on corn leaves and resting on the under side of coffee leaves in the coffee grove at that time opposite Central Vannina. Four species of aerial lizards found them sufficiently abundant and easy to catch as to form a considerable item in their food, and indeed they are reasonably abundant at all times in at least the more humid sections of the Island, as is indicated by numerous interceptions on various non-significant hosts. When trees of "jobo" (*Spondias mombin*) mature fruit, these blue bottle flies are more in evidence than the fruitflies whose maggots develop in the fruits, altho they have been observed only feeding on the exuding juice. Dr. C. H. Curran (1928–91) notes that they are separable from the other species of *Morellia* by having "humeri yellow," and lists collections in the Virgin Islands of St. Croix, St. John and St. Thomas, as well as in numerous localities in Puerto Rico, of which the most xerophytic are Coamo and Mayagüez.

Morellia violacea (Fabricius) is distinctively iridescent or metallic purplish in body color, in addition to having "humeri metallic" noted by Dr. C. H. Curran (1928–91). Altho not especially abundant, this purple bottle fly was collected by Dr. Gundlach, and is listed by him, as identified by Herr Victor von Roeder, as *Pyrellia centralis* Loew. Dr. Alex. Wetmore found it eaten by the wood pewee, and it is possibly most often to be found in the mountains, when numerous interceptions have been made in orange or coffee groves.

Musca domestica Linnaeus, the common house fly, was listed by Drs. Stahl and Gundlach, by von Roeder and Coquillett, and is number 1717 in Van Zwaluwenburg's list. Dr. C. H. Curran (1928–91) lists it from San Juan and Santurce, and identified it in the AMC collection from many other insular localities. It has been determined from Mona Island by Mr. David G. Hall, and noted in airplanes between Puerto Rico and Mona, and between Puerto Rico and Vieques Island. Despite the numerous records it is not nearly as abundant at the present time, when automobiles supply the bulk of the transportation, as when all or most of the transportation requirements of the Island depended on horses or mules. This is especially notice-

able in Río Piedras, where a livery stable opposite the first stop after leaving "entrada del trolley" invariably filled the street-car with flies. Piles of fresh "cachaza" or filter press cake are the only other major breeding-places for the flies, the heat of its decomposition being essential for the mass development of fly maggots however, so that spreading the cachaza in the fields promptly abates the plague. Flies identified by Dr. J. M. Aldrich have developed from maggots in the trunk of a rotten palm tree at Añasco, and from others intercepted in rotten pumpkins at Arroyo. In the artificial rearing of fruitfly parasites the immature stages of the house fly have proved most useful because of abundance and ready availability at all times of year, having been used by Dr. K. A. Bartlett (1939–6) for *Spalangia philippinensis* Fullaway, *Dirhinus giffardi* Silvestri and *Muscidifurax raptor* Girault & Sanders.



The common House Fly, *Musca domestica* Linnaeus: puparium at left, adult center, larva and enlarged parts at right. (After Howard, U. S. D. A.)

Synthesiomyia nudiseta Van der Wulp, of which S. *brasiliana* Brauer and Bergenstamm is a synonym, has been identified by Dr. J. M. Aldrich: flies collected at Río Piedras of which the presence of the silvery pollenosity on their thorax appears to change with the angle at which it is observed.

Stomoxys calcitrans (Linnaeus), originally described as a *Conops* from Sweden, is by now an international pest of livestock, having been present in Puerto Rico at least as far back as when Dr. Gundlach made the first collection here. This stablefly, or biting housefly, was noted on Vieques Island by Mr. Aug. Busck, but has not been recorded from Mona Island, presumably because the only large domestic animals there are cows, pigs and goats, and this fly prefers horses to bite and horse manure in which to lay its eggs. Dr. F. M. Root (1922–405) notes it "feeding on cattle, horses and goats." Dr. H. L. Van Volkenberg (1939–4) concludes that it is "common but not very abundant."

Siphona irritans (Linnaeus), the horn fly, or "mosca del ganado," is a

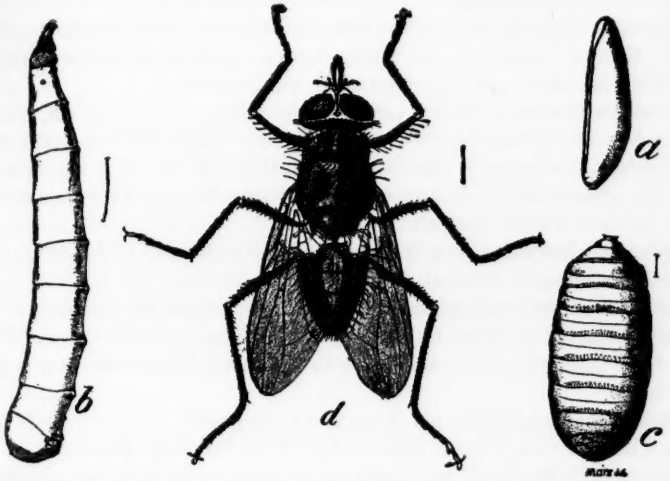
comparatively recent arrival in Puerto Rico, for it was not collected by Dr. Gundlach or Mr. Aug. Busck, and the first local record is in Van Zwaluwenburg's list, where it is called *Lyperosia irritans* L. It is presumed that the horn fly was brought to Puerto Rico in importations of livestock from the southern states sometime after the American occupation: the adults on cattle and mules, and the immature stages in their excrement. If not first established in the southwestern corner of the Island, the horn fly is certainly most abundant there now, and indeed has been ever since it was first noted. Mr. G. B. Merrill was stationed at Hda. Santa Rita, Guánica, and upon observations made on the life-history, bionomics, parasites, predators and comensals in this region is based his "Progress Report on Investigations relative to the Horn-Fly" (*in* Third Report, Board of Commissioners of

The common Stablefly, *Stomoxys calcitrans* (Linnaeus), six times natural size. (After Howard, U. S. D. A.)

Agr. P. R., 1913–14, pp. 53–54. San Juan, 1915), in which the name used is *Haematobia serrata* Desvoidy. Despite the brevity of this report, later writers on the horn fly in Puerto Rico have added surprisingly little to what Mr. Merrill recorded, until Dr. Kenneth A. Bartlett's account of "The Introduction into Puerto Rico of Beneficial Insects to aid in the Control of the Horn Fly of Cattle" (Agr. Notes No. 88, pp. 6, P. R. Expt. Station, Mayagüez, March 31, 1939). Desirable as biologic control may be theoretically, the possibility of using DDT for spraying the cattle in the regions where the horn fly is most abundant for a time made other methods academic. Because of the development of DDT-resistant strains of flies however, methoxychlor, toxaphene or other chlorinated hydrocarbon is now to be preferred. Dr. H. L. Van Volkenberg (1939-4) considers the horn fly "common and widespread but not very abundant except in the dry southern coastal plain," and it has not been noted at all in the mountain,

and but rarely in the more humid sections of Puerto Rico. Dr. M. D. Leonard (1933–130) records it from Vieques Island, but it has not been found on Mona.

Neomuscina tripunctata (Van der Wulp), of which Dr. J. M. Aldrich considers *N. cavicola* Townsend a synonym, was collected in Puerto Rico by Mr. Aug. Busck, as identified by Mr. D. W. Coquillett.



The Horn Fly of Cattle, *Siphona irritans* (Linnaeus): *a*, egg, *b*, larva, *c*, puparium *d*, adult, ten times natural size. (After Howard, U. S. D. A.)

Anthomyiidae: Root Maggots

Atherigona excisa Thomson, of which Dr. J. M. Aldrich gives as synonyms *A. orientalis* Schiner and *A. pulvinata* Grimshaw, was determined by him for Dr. Richard T. Cotton, who first in Puerto Rico reared these slender grey flies with broadly oval wings from decaying eggplant. Subsequently it has been repeatedly intercepted as maggots from decaying oranges at Barceloneta and Mayagüez, from kernels of corn, in decaying string beans at Isabela, in decaying tomatoes at Aguadilla and Isabela, from roots of dasheen and from the fruit of cashew or "pajuíl" (*Anacardium occidentale*) at Bayamón.

Ophyra aenescens (Wiedemann), originally described as an *Anthomyia* from New Orleans and the West Indies, was collected in Puerto Rico by Dr. Gundlach, as identified by Herr Victor von Roeder, and has since been intercepted at Mayagüez by Mr. A. G. Harley.

Limnophora arcuata Stein, listed by Mr. D. W. Coquillett (1900–256) as

occurring in Puerto Rico, having been collected in 1899 by Mr. Aug. Busck, is identified by Dr. C. H. Curran (1928–91) from Naguabo and Mayagüez. It has since been intercepted at Naguabo, San Juan and Arecibo.

Limnophora narona (Walker), originally described as an *Anthomyia* from Florida, was intercepted resting on melon leaves at Caguas, as identified by Dr. J. M. Aldrich. Another species of *Limnophora* is also present in Puerto Rico according to Dr. C. H. Curran (1928–91).

Myospila obsoleta (Brauer and Bergenstamm) has been identified by Dr. C. H. Curran (1928–90) from Cuba, Jamaica and Haiti, besides Arecibo, Adjuntas and Jayuya in the mountains of Puerto Rico.

Coenosia flavipes Williston, originally described from St. Vincent, is identified from St. Thomas by Dr. C. H. Curran (1928–89) who states that "Coquillett has reported this species from Porto Rico." Dr. Curran finds another species of *Coenosia* from Puerto Rico, "having the femora mostly and the tarsi wholly blackish."

Bithoracochaeta despecta Walker, as identified by Dr. J. M. Aldrich, was swept from grass at Corozal.

Bithoracochaeta leucoprocta (Wiedemann), originally described as an *Anthomyia* from the West Indies, was identified by Dr. C. H. Curran (1928–87) from Jamaica, Cuba, and Orocovis in Puerto Rico, with "legs mostly yellow."

Bithoracochaeta varicornis (Coquillett), originally described (1900–256) as a *Coenosia* from Puerto Rico, collected by Mr. Aug. Busck, Dr. C. H. Curran (1928–88) found very common, with specimens from all parts of the Island, with "legs mostly black."

Leucomelina corvina Giglio-Tos, as identified by Dr. J. M. Aldrich, swept from weeds at Río Piedras, intercepted on orange flowers at Adjuntas and on grapefruit leaf at Barceloneta, was previously known from Mexico. Dr. Aldrich identifies a *Leucomelina* intercepted on El Yunque as being a new species.

Lispe rufitibialis Macquart, originally described from South America, was identified by Mr. D. W. Coquillett (1900–256) as having been collected by Mr. Aug. Busck at Fajardo and on Culebra Island.

Philornis obscura Van der Wulp was identified by Mr. C. T. Greene from a fly intercepted at Ponce by Mr. R. G. Oakley.

Philornis pica Macquart was identified by Mr. David G. Hall for Dr. H. L. Van Volkenberg (1939–4) who reports "the warble-like larvae are common in the grackle or mozambique, *Holoquiscalus niger brachypterus*, at Mayagüez."

Fannia femoralis (Stein) was identified by Dr. C. H. Curran (1928–89) from Hispaniola, St. Thomas and Santurce, Mayagüez and Ensenada in Puerto Rico.

Fannia pusio Wiedemann was identified by Dr. J. M. Aldrich from San Juan, Puerto Rico; a fly resting on the hedge of "café de la India" (*Chalcas exotica*) around the postoffice building.

Calythea crenata (Bigot), originally described as a *Trichophthicus* from Mexico, was identified with "some doubt" by Dr. C. H. Curran (1928–89) from St. Thomas, and Cayey, Aibonito and Mayagüez in Puerto Rico. He also indicates flies from San Juan as being of the genus *Tetramerinx*.

Neodexiopsis rex, described by Dr. C. H. Curran (1928–88) from a single male from 1,500 feet up on El Yunque, is 4.5 mm. in length, "head, thorax, apical two abdominal segments and the tarsi blackish, elsewhere reddish-yellow."

Fucellia maritima Haliday is cited by Dr. L. O. Howard as *Fucellia fucorum* Fallen in his "A Contribution to the Study of the Fauna of Human Excrement" (Washington Academy of Sciences, **2:** 541–604, illus. Washington, D. C., December 28, 1900) as occurring on Culebra Island having been collected by Mr. Aug. Busck. In his card catalog which is on file in the U. S. National Museum, Dr. J. M. Aldrich wrote "mistake." "This species," according to Dr. Aldrich (1905–564) "is common on seaweeds and other refuse," but can hardly be present in Puerto Rico as it has not since been found here, and most of the records are from Greenland, Alaska and northern Europe.

Scopeumatidae (Cordyluridae or Scatophagidae): Dung Flies

Scopeuma exotica (Wiedemann) was listed by Mr. D. W. Coquillett (1900–257) as *Scatophaga*, collected by Mr. Aug. Busck on Culebra Island. It is not known from Vieques, Puerto Rico or Mona, but the cosmopolitan *Scopeuma stercorarium* (L.) is very common on fresh dung at the higher elevations in Hispaniola. Dr. E. O. Essig (1926–600) describes it as "a slender, pilose, tawny or yellowish brown fly, the males with long pile, very common on cow dung in which the larvae breed. The adults are predaceous on the blow fly and house fly, (being) common in the west."

Sphaeroceridae (Borboridae)

Leptocera angulata (Thomson) was identified by Dr. C. H. Curran (1928–69) from many Puerto Rican localities, from El Yunque to Ensenada, being common in all parts of the Island.

Leptocera discalis (Malloch) occurs in St. Croix, and in many Puerto Rico localities, according to Dr. C. H. Curran (1928–69).

Leptocera fontinalis (Fallén), a European and North American species, was recorded from Puerto Rico by Mr. D. W. Coquillett, having been collected by Mr. Aug. Busck.

Leptocera lugubrina was described by Mr. J. R. Malloch as a *Limosina*

from Puerto Rico in his "Descriptions of New Species of American Flies of the Family Borboridae" (Proc. U. S. National Museum, **44** (1958): 361-372. Washington, D. C., February 20, 1913).

Leptocera sublugubrina Malloch (1912), for *L. lugubris* (Williston) preoccupied, originally described as a *Limosina* from St. Vincent, was collected in Puerto Rico by Mr. Aug. Busck.

Leptocera niveipennis (Malloch) was described as a *Limosina* (1913-361), the type from Peurto Rico.

Leptocera perparva (Williston), described from St. Vincent, occurs in Puerto Rico according to Mr D. W. Coquillett (1900-269).

Leptocera pumilla (Williston) was identified from Puerto Rico by Dr. C. H. Curran (1928-69): specimens from Aibonito and Naguabo.

Leptocera rotundipennis (Malloch) was described (1913–361) as a *Limosina* from Puerto Rico.

Leptocera venalicia (Osten Sacken), supposed to have been introduced from Africa into Cuba by the slave trade, known also from St. Vincent and Brasil, was collected in Puerto Rico by Mr. Aug. Busck, according to Mr. D. W. Coquillett (1900–269), and has since been intercepted at Mayagüez.

Sciomyzidae (Tetanoceridae)

Sepedon caeruleus Mel., as identified by Dr. J. M. Aldrich, occurs in all parts of Puerto Rico, the AMC collection containing specimens from El Yunque, Orocovis, Mayagüez, San Germán and Cartagena Lagoon.

Sepedon macropus Walker, a reddish-yellow fly, its wings clouded with brown, was originally described from Jamaica and occurs also in Cuba. Dr. Gundlach first collected it in Puerto Rico, as identified by Herr Victor von Roeder. Dr. C. H. Curran (1928–86) identified specimens from Caguas, Cayey and Coamo, and in the AMC collection from Río Piedras, Mayagüez and the Cartagena Lagoon.

Lonchaeidae

Lonchaea chalybea Wiedemann, originally described from South America, was first reported from Puerto Rico by Mr. O. W. Barrett (*in* Annual Report P. R. Expt. Station for 1903, pp. 429–450, Office of Experiment Stations, Washington, D. C., 1904) on page 447, as a pest of *Manihot utilissima* and *M. palmata*, and in the following year (1905–396) he mentions the larva as "a serious pest in the tips of cassava canes." For control, handpicking and tobacco dust are recommended. Locally, and in Cuba, this is called "centella de la yuca." Mr. Policarpo González Rios gives an economic account as "El Gusano del Cogollo de la Yuca" (Rev. Agr. P. R., **10** (4): 45-6. San Juan, 1923) of the attack by the maggots of this common, and at times, serious pest. It occurs in all parts of the Island where yuca is planted but is possibly most abundant in the sandy areas. The adults are

little blue-black iridescent flies, with clear wings, sometimes to be seen on the host of the larva, but much less conspicuous than the stunted, gum-exuding, and withering tips which the feeding of the latter cause.

Lonchaea bruneri Malloch, as determined by Mr. C. T. Greene, was originally described from Cuba, reared by Mr. S. C. Bruner from maggots attacking the tips of lima bean vines. This insect is known in Puerto Rico only from material collected by Mr. Pedro Osuna from the same host at La Muda, between Río Piedras and Caguas.

Lonchaea glaberrima Wiedemann was originally described from the West Indies and reported from southern Florida. This name was given by Mr. R. H. Van Zwaluwenburg to specimens he had reared from pods of *Inga vera*, and are P.R. 1664 in his list. They have recently been re-determined by Mr. C. W. Sabrosky as a species of **Carpolo chaea.**

Lonchaea longicornis Williston, originally described from St. Vincent, is reported from Puerto Rico by Mr. D. W. Coquillett (1900–258), having been collected by Mr. Aug. Busck.

Lonchaea nigrocoerulea Malloch was identified by Dr. C. H. Curran from Mayagüez and Tallaboa, Puerto Rico (1928–85), and for Dr. W. A. Hoffman, who collected specimens at light at San Juan. Flies repeatedly intercepted at Mayagüez were identified by Dr. J. M. Aldrich as a new species of *Lonchaea*.

Carpolonchaea pendula Bezzi, as identified by Mr. C. T. Greene, has been repeatedly intercepted in Puerto Rico: reared from orange fruit at San Juan and Mayagüez, reared from lima beans at Isabela and reared from fruit of *Inga laurina* at Jayuya. As identified by Mr. David G. Hall, adults have been collected on Mona Island along the beach by Dr. Luis F. Martorell.

Lauxaniida

Camptoprosopella cincta (Loew), described originally from Cuba as a *Sapromyza*, was first collected in Puerto Rico by Dr. Gundlach, as identified by Herr Victor von Roeder. This "shining rusty reddish" fly, 3.0 mm. long, "wings not infuscated; only two pairs of dorso-central bristles," was redescribed by Dr. C. H. Curran (1926–13) as *C. diversa*, from material from Coamo and Arecibo in Puerto Rico, Mona Island and from Fond Parisién and other localities in Haiti. He later (1931–18) recognized its synonymy. Flies intercepted in a grapefruit grove near Añasco are considered by Dr. J. M. Aldrich to be a new species of *Camptoprosopella*.

Physogenua ferruginea (Schiner), originally described as a *Griphoneura* from Costa Rica and known to occur in Mexico, was identified by Dr. J. M. Aldrich from flies swept from grass at Ciales, and later from flies in coffee grove at Lares and intercepted at Loiza.

Physogenua vittata Macquart, originally described from Brasil and known from others of the West Indies, was listed by Drs. Stahl and Gund-

lach as *Lauxania variegata* Loew, as identified by Herr Victor von Roeder. Dr. C. H. Curran (1928–81) identifies this fly from several localities in western Puerto Rico and from specimens in the AMC collection from Matrullas, but it is not localized in distribution, for interceptions have been made at San Juan, and in Isabela Grove at Palo Seco.

Neogriphoneura sordida (Wiedemann), originally described from the West Indies as a *Sapromyza*, and recorded by Mr. D. W. Coquillett from Puerto Rico and the southeastern United States, was identified by Dr. C. H. Curran (1928–82) from the Island of St. Croix of the Virgin Islands, from several localities in Puerto Rico, and from Mona Island. Numerous specimens in the AMC collection from Ponce, Hormigueros, Mayagüez and Río Piedras he also identified as this species.

Pseudogriphoneura albovittata (Loew), originally described as a *Lauxania* from Cuba, and thus identified by Herr Victor von Roeder from the collections made by Dr. Gundlach in Puerto Rico, is recognized by Dr. C. H. Curran (1928–82) by having the "thorax opaque black, with two ashy vittae connected behind by the ashy scutellar margin," specimens from Mayagüez. Others are from Cidra, and these flies have been repeatedly intercepted in grapefruit groves at Mayagüez and Arecibo.

Pseudogriphoneura octopunctata (Wiedemann), described originally as a *Sapromyza* from the West Indies, was thus identified by Herr Victor von Roeder from the material collected by Dr. Gundlach in Puerto Rico. What Dr. C. H. Curran (1931–19) thinks may be this fly was what he described (1926–13) as *Deceia anomala:* "length 2.5 mm.; rusty yellowish, shining, the three or four apical abdominal segments each with a black spot on either side; thorax usually pale yellow, with a black spot on the upper anterior part of the sternopleura; scutellum with a black spot on either side between the marginal bristles."

Pseudogriphoneura vittifacies was described by Dr. C. H. Curran (1931–20), the type from Aibonito, other from Adjuntas, similar to what he had previously reported (1928–83) as *Lauxania cineracea* Coquillett, "but at once distinguished by the presence of two or four shining vittae on the face, and the reddish, more extensively brown-pollinose mesonotum and scutellum; length 4.0 mm." Dr. J. M. Aldrich considers flies intercepted at Cidra as representing a new species of *Pseudogriphoneura*, which may be what Dr. C. H. Curran identified in the AMC collection from Matrullas.

Caliope lutea (Coquillett) is identified with considerable doubt by Dr. C. H. Curran (1928–83); specimens from Arecibo and Aibonito, Puerto Rico. This fly was described from specimens collected in southern Florida as a *Lauxania*.

Caliope scutellata was described by Dr. C. H. Curran (1926–14) from a single specimen from Naguabo, so badly damaged that its sex could not be determined; "similar to *lutea* Coquillett," but "the scutellum bears a large, transverse, apical brownish spot."

Minettia aibonito was described by Dr. C. H. Curran (1926–14): "length 2.0 mm.; pale rusty yellow, the abdomen with three series of small, round brown spots; head and thorax conspicuously cinereous pollinose, the abdomen thinly so." A fly answering to its description has been intercepted at Guayama.

Minettia mona was described by Dr. C. H. Curran (1926–13) from a number of specimens from Mona Island, others from Naguabo and Aibonito, Puerto Rico. It is 3.5 mm. long, "rusty reddish yellow, the head and thorax grayish pollinose; scutellum and abdomen shining; abdomen with three to five series of black spots." The most intensive collecting by Prof. J. A. Ramos did not discover any additional specimens of this fly on Mona Island.

Minettia macula (Loew), described originally from Texas, and thought by Prof. S. W. Williston to be a possible synonym for *Sapromyza octopunctata* Wiedemann, was identified from Puerto Rico (in synonymy with *S. valida* Walker) by Dr. J. M. Aldrich: specimens collected by Mr. E. G. Smyth at Río Piedras in October 1916. Others of "this little brown fly with striped thorax" have been intercepted at Mayagüez, and swept from malojillo at Bayamón.

Minettia picticornis (Coquillett) was identified by Dr. C. H. Curran (1931–20) from two specimens collected by Dr. W. A. Hoffman at Dorado. It is a little yellowish fly, banded and spotted with brown, or, as phrased by Dr. Curran, "the mesonotum bears four black vittae and the abdomen a median row of roundish spots and lateral rows of transverse ones." It has been intercepted in a grapefruit grove at Arecibo, as identified by Dr. J. M. Aldrich, and most recently collected at Río Piedras, resting on concrete column, as identified by Mr. C. W. Sabrosky.

Minettia slossonae (Coquillett), originally described as a *Sapromyza* from Biscayne Bay, Florida, is apparently one of the most abundant of these flies in Puerto Rico, Dr. C. H. Curran (1928–84) identifying it from the Virgin Islands of St. Croix and St. Thomas, from various localities in Puerto Rico and from Mona Island. He states that "Malloch considers this to be only a variety of *octopuncta* Wiedemann (*octopunctata* auct.)." Specimens identified as this species by Dr. J. M. Aldrich have been intercepted at Mayagüez, swept from malojillo at Bayamón and in an orange grove at Pueblo Viejo.

Minettia sororia (Williston), originally described as a *Sapromyza* from St. Vincent, was identified by Dr. C. H. Curran (1928–85) from Puerto Rico: a single specimen from Aibonito.

Trigonmetopus angustipennis Knab was the identification by Dr. J. M. Aldrich of flies intercepted by Mr. R. G. Oakley, resting on pomarrosa at Cidra, and in the mountains back of Yauco. To specimens previously

submitted which had been collected in abandoned coffee groves at Indiera, he had given the identification of "sp. nov." in this genus. *T. rotundicornis* Williston was described from St. Vincent. Dr. C. H. Curran identifies flies in the AMC collection from Matrullas as **Trigonmetopus vittatus** Loew, a species originally described from Georgia.

Otitidae (Ortalidae)

"*Pyrgota undata* Wiedemann is a fly of extraordinary appearance and habits, the females of which lay eggs in (May) beetles, attacking them when

Pyrgota undata Wiedemann, a continental Otitid fly which is parasitic on May Beetles, three times natural size. (After Davis.)

they are flying by night, and the ovipositor can be inserted though the unprotected tender skin of the upper part of the abdomen." As related in an early account of "Insect Parasite Introduction in Porto Rico" (Jour. Dept. Agr. P. R., **6** (1): 5–20, fig. 7. San Juan, October 1922), "in some years, large numbers of *Lachnosterna* beetles in Illinois are parasitized, but during the summers of 1913 and 1914, when many beetles were collected, this fly was comparatively rare, and only an occasional parasitized beetle was found. Several fly puparia inside dead beetles were collected in plowed fields and sent to Puerto Rico, but no adults emerged."

Xanthacrona bipustulata Van der Wulp, originally described from Mexico, was identified by Dr. C. H. Curran (1928–77) from Jamaica, and from Puerto Rico a single specimen from Coamo.

Acrosticta apicalis (Williston), originally described as an *Euxesta* from St. Vincent, was listed by Mr. D. W. Coquillett (1900–258) from Puerto Rico, specimens having been collected by Mr. Aug. Busck. It is an iridescent blue-black fly, with clear wings except for the front margin and apex, repeatedly collected since, as identified by Dr. J. M. Aldrich, in the more humid parts of the Island: attracted to rotting fruit, such as grapefruit and over-ripe hog-plums or "jobo" (*Spondias mombin*), and to the exuding juices on corn leaves.

Acrosticta foeveolata Loew is identified by Dr. C. H. Curran (1928–77) from many localities in the more humid section of Puerto Rico, and from the Island of St. Thomas.

Acrosticta pallipes Grims., as determined by Mr. C. T. Greene, was quite abundant in the Isabela ginnery in August 1945, and numerous dead flies were collected from the window-sills and floor after it has been sprayed with DDT.

Euxesta abdominalis Loew, originally described from Cuba, is one of the most common of this genus in Puerto Rico, if one may judge by the number of north coast localities from which Dr. C. H. Curran (1928–79) identified specimens, including Mona Island. The "base of the abdomen (is) usually reddish" in this otherwise blue-black iridescent fly.

Euxesta annonae (Fabricius), originally described as a *Musca* from the West Indies, was first reported from the collections of Dr. Gundlach in Puerto Rico by Herr Victor von Roeder, and Mr. F. Knab identified specimens collected at Mayagüez for Mr. R. H. Van Zwaluwenburg. Dr. C. H. Curran (1928–79) lists specimens from the Virgin Islands of St. Croix and St. Thomas, from many mountainous localities in Puerto Rico as well as San Juan, Arecibo, Mayagüez and Ensenada, and from Mona Island. On Vieques Island, Dr. M. D. Leonard and Prof. Wm. T. M. Forbes collected this fly, as identified by Dr. Curran (1931–17).

Euxesta costalis (Fabricius), originally described as a *Musca* from the West Indies, was first collected in Puerto Rico by Dr. Gundlach, as identified by Herr Victor von Roeder. Dr. C. H. Curran (1928–78) reports it only from the Virgin Islands of St. John and St. Thomas.

Euxesta eluta Loew, originally described from Cuba, is identified by Dr. C. H. Curran (1928–78) for specimens from Naguabo to Ensenada, and intermediate points in Puerto Rico. It has been reared from maggots intercepted in silk of sweet corn at Mayagüez.

Euxesta mitis was described by Dr. C. H. Curran (1931–17) from two females collected by Prof. W. T. M. Forbes on Vieques Island. It is "a very small species, 2.25 to 2.4 mm. long, with three brownish-black spots on the wings (as illustrated), and a very prominent clypeus."

Euxesta notata (Wiedemann), originally described as an *Ortalis* from

Savannah, Georgia and New York, occurs thruout the eastern United States, the larvae having been found in sumac fruit in Virginia, cotton bolls in Alabama, onions in New Jersey and the pulp of Osage orange (*Maclura* or *Toxylon pomifera*). On February 1, 1926, Mr. Francisco Seín collected ten of these flies "running over half rotten oranges dumped out doors in Mayagüez. The flies laid eggs on the sides of the moist vial in which they were kept. The eggs hatched in three days, and the larvae (cream-colored with two dots on the hind end) were fed on pieces of orange placed inside the vial. Some continued their development on the orange tissues after they had rotted. They pupated in soil placed in the tubes and on the cloth which closed the opening. Flies emerged twenty-three days after the eggs hatched, or 26 days from egg to adult. (Later) this fly was observed walking over fruits at a picnic in a coconut grove at Loiza." These flies have also been intercepted on over-ripe fruits of "jobo" (*Spondias mombin*) in the metropolitan area and at Dorado. Messrs. Richard Faxon and C. P. Trotter, discussing their experiences with the "Plant Quarantine Service in Porto Rico" (Jour. Ec. Ent., **25** (3): 435–447. Geneva, June 1932), state that "the spotted root fly, *Euxesta notata* Wied., has been taken many times from oranges and less frequently from grapefruit. It has not been proved how this insect gains entrance to the fruit, but it seems probable that the infestation is secondary."

Euxesta spoliata Loew, originally described from Cuba, was first collected in Puerto Rico by Dr. Gundlach, as identified by Herr Victor von Roeder, and was listed by Mr. D. W. Coquillett (1900–258) as having been collected by Mr. Aug. Busck. Dr. C. H. Curran (1928–78) has identified it from the Island of St. Croix and from several localities in Puerto Rico, and it has been intercepted in an orange grove at Mayagüez.

Euxesta stigmatias Loew, originally described from Cuba and Brasil, was first collected in Puerto Rico by Dr. Gundlach, as identified by Herr Victor von Roeder. Dr. C. H. Curran determined specimens from the Island of St. Croix (1928–78), from several localities in Puerto Rico, and from Mona Island. It had been repeatedly intercepted, and once reared from rotten corn before Mr. B. A. App reported on the habits of the maggots of "*Euxesta stigmatias* Loew, an Otitid fly infesting ear corn in Puerto Rico" (Jour. Agr. Univ. P. R., **22** (2): 181–188. Río Piedras, May 1938). He found it a serious pest of sweet corn being grown experimentally. In the Annual Reports of the Experiment Station at Mayagüez for 1939 to 1941 the practical means of control by spraying with pyrethrum, or treating with mineral oil as for corn earworm, are discussed.

Euxesta thomae Loew, originally described from St. Thomas, and listed from Puerto Rico by Mr. D. W. Coquillett (1900–257) as collected by Mr. Aug. Busck, is not recognized by Dr. C. H. Curran. It has been repeatedly

The Corn Ear Otitid Fly, *Euxesta stigmatias* Loew: 1, adult, about twelve times natural size, 2, egg, 3A, lateral aspect of larva, 3B posterior aspect of larva, 3C, posterior spiracle, 3D, anterior spiracle, 4A, lateral aspect of puparium, 4B, posterior aspect of puparium, 4C, posterior spiracle, 4D, anterior spiracle. (Drawn by Mrs. Mary Foley Benson.)

identified by Dr. J. M. Aldrich, and presumably is one of the most common of the genus, being especially abundant in cane fields, around cane cars, attracted to chewed cane on the ground, and to human feces. It is eaten by the little grass lizard (*Anolis pulchellus*), but is not an important item in the diet of lizards, for it is not easy to catch, being wary and taking flight with exceptional rapidity, altho promptly returning to a desirable bit of chewed-up cane when no danger threatens, and flirting its wings derisively at the foiled lizard. It occurs in all parts of the Island, being quite as abundant in the cane fields of the south coast as in those of the more humid regions. It has been repeatedly intercepted resting on various non-significant objects, as well as on ripe or rotting oranges at Mayagüez, on juice-exuding fruit of "jobo" (*Spondias mombin*) and on rotting papayas at Isabela. Mr. Francisco Seín records the collection by Mr. E. Muños at Camuy of larvae and pupae of this fly in tunnels in the trunk of dead coconut palms made by *Xyleborus* beetles.

Tetanops sp. is listed by Dr. Alex. Wetmore (1916–66) as having been eaten by the tody, *Todus mexicanus*. Flies identified as *Stenops* sp., and others as "near *Neoacanthoneura* sp." have been found in fruitfly traps at Mayagüez. Dr. Stahl lists *Ortalis quadrivittata* Macquart.

Notogramma stigma (Fabricius), originally described as a *Musca* from the West Indies, and known to occur in Cuba, was recognized by Dr. C. H. Curran (1928–79) from Adjuntas and Ensenada in Puerto Rico, and from Desecheo and Mona Islands.

Chaetopsis fulvifrons (Macquart) is recorded from Puerto Rico by Dr. C. H. Curran (1928–80): three specimens from San Juan.

Chaetopsis quadrifasciata is described by Dr. C. H. Curran (1928–80) from a type from Orocovis, Puerto Rico; others from San Juan and Miami, Florida. It is 4.0 to 5.0 mm. long, having "wings with four blackish-brown crossbands, the apical two connected along the costa."

Setellia amabilis (Williston), originally described as an *Epiplatea* from St. Vincent, is identified by Dr. C. H. Curran (1931–17): specimens from El Yunque collected by Prof. W. T. M. Forbes.

Epiplatea erosa Loew, originally described from Cuba, was intercepted at Mayagüez by Mr. A. G. Harley, as determined by Dr. J. M. Aldrich.

Macrostenomyia guerini (Bigot), originally described as a *Sepsis* from Cuba, was first collected in Puerto Rico by Dr. Gundlach, and identified as a *Stenomacra* by Herr Victor von Roeder. Dr. C. H. Curran (1931–17) identified as this species a pair collected by Dr. M. D. Leonard at Cidra, and another pair collected by Prof. W. T. M. Forbes at Coamo. As identified by Dr. J. M. Aldrich it has been intercepted in an orange grove at Ponce by Mr. R. G. Oakley, in fruitfly trap at Mayagüez, and at Maricao.

Tephritidae (Trypetidae): Fruitflies

Toxotrypana curvicauda Gerstaecker, originally described from the "Island of St. Jean of the Danish West Indies," now called St. John of the U. S. Virgin Islands, is known also from tropical South and Central America, Yucatan in Mexico, southern Florida, Cuba, Hispaniola and the Bahama Islands. It was first reported from Puerto Rico by Dr. C. W. Hooker (*in* Ann. Rpt. P. R. Expt. Station for 1912, pp. 34-38. Washington, D. C., July 26, 1913) as "abundant at Mayagüez. The eggs are laid well below the surface of the green fruit of papaya (*Carica papaya*); 2 to 15 or more larvae within the fruit, and when it drops, pupate 1 or 2 inches below the surface of the ground below the fruit. Adults emerge in 17 to 21 days, and eggs for another brood are soon laid." The "Papaya Fruit Fly'

Female of the Papaya Fruitfly, *Toxotrypana curvicauda* Gerstaecker, two and a half times natural size. Lateral view of ovipositor below. (Drawn by L. Pierre-Noël.)

(Jour. Agr. Research, 11 (6): 447–457, pl. 2. Washington, D. C., September 21, 1914) was intensively studied by Messrs. Frederick Knab and W. W. Yothers in Florida, who observed "that fruit with very thick meat escapes infestation. While the papaya fruit fly attempts to oviposit on such fruit, the thickness of the meat prevents the tip of the ovipositor from reaching the seed cavity, and in the meat itself the larvae cannot live." Instances have been noted in Puerto Rico, however, of a thick-fruited variety, of which the seed was reported to have come from Africa, heavily infested at Cupey, above Río Piedras. Thin-fleshed fruit has also been found infested at Bayamón and at Guayama, but heaviest infestations have invariably been in the western end of the Island, primarily at Mayagüez,

as noted by Mr. W. V. Tower and in Van Zwaluwenburg's list (1243), and at Isabela, to which Dr. M. D. Leonard & Mr. Francisco Seín, writing of "The Papaya Fruit Fly in Puerto Rico," (Jour. Ec. Ent, **24** (1): 331-2. Geneva, February 1931) add Lares, and Messrs. Richard Faxon and C. P. Trotter (1932–446) add Ponce. At Mayagüez also, in the 1938 Report of the P. R. Experiment Station (1939–100), parasitizm by *Dirhinus giffardi* Silvestri is reported.

Anastrepha edentata (= *Anastrepha* sp. "F" of Plant Commissioner Arthur C. Brown *in* Florida State Plant Board Biennial Report, 11: 20–21. Gainesville, 1937) was described by Dr. Alan Stone as one of new species of "The Fruitflies of the Genus *Anastrepha*" (U. S. D. A. Misc. Pub-

The Jobo Fruitfly, *Anastrepha mombinpraeoptans* Seín, eight times natural size. (Drawn by Fritz Maximilien.)

lication No. 439, pp. 112, pl. 23, fig. 22, ref 10. Washington, D. C., January 1942), "small and yellow brown," the type from Key Largo, Florida, others from Mayagüez, P. R., collected in trap, "taken every month in the year on the Florida Keys, but the host has not been discovered."

Anastrepha mombinpraeoptans was described by Mr. Francisco Seín as a variety of *A. fraterculus* Wiedemann in his study of "*Anastrepha* (Trypetidae, Diptera) Fruit Flies in Puerto Rico" (Jour. Agr. P. R., **17** (3): 183–196, pl. 5, ref. 11. San Juan, November 14, 1933), the type from Rio Piedras, reared from fruit of "jobo" (*Spondias mombin*), others from fruit of "ciruela" (*Spondias cirouella* and *S. purpurea*), the fruit of some varieties of mango (*Mangifera indica*), rarely in fruit of "jobo de la India"

(*Spondias dulcis*), occasionally in fruit of guava (*Psidium guajava*) or "pomarrosa" (*Eugenia jambos*). "The egg is inserted in the fruit up to the shoulder, the head and neck protruding outside the cuticle" of the fruit. This is the common frutifly of the West Indies, first reported from Puerto Rico by Dr. Gundlach as *Acrotoxa fraterculus* Wiedemann, as determined by Herr Victor von Roeder. Mentioned by Mr. D. L. Van Dine as one of the important "Mango Insects in Porto Rico" (First Ann. Rpt. P. R. Hort. Soc. for 1912, pp. 20–22. San Juan, 1912), it was more extensively discussed by Mr. W. V. Tower (1912–34 to 35) as *A. acidusa* Walker, attacking the fruit of imported mangoes, especially the Cambodiana variety. Mr. C. F. Kinman, writing of "The Mango in Porto Rico" (P. R. Expt. Station, Bulletin No. 24, pp. 30, pl. 11. Washington, D. C., 1918) recommended enclosing ripening fruits in individual paper bags to prevent infestation. Dr. C. W. Hooker (1913–36) using the name *Anastrepha fraterculus* Wiedemann, "closely related to *A. acidusa*" as determined by Mario Bezzi, notes that this jobo fruitfly may also attack one native variety of mango: mango de puerco, and that the maggots in jobo fruits are parasitized by *Opius* (*Utetes*) *anastrephae* sp. nov. Viereck and *Ganaspis* sp. nov., which Mr. J. C. Crawford later described as *hookeri*.

The hearing held by the Federal Horticultural Board to consider the advisability of restricting or prohibiting the entry from Porto Rico of fruits and vegetables into the Unites States (Jour. Dept. Agr. P. R., **8** (1): 5–46, pl. 1. San Juan, August 1925) was, to a very considerable extent, due to this fruitfly, and the uncertainty as to its exact distribution and status. It was shortly thereafter that Mr. Francisco Sein commenced his investigations which eventually indicated morphological and physiological differences separating it from what he described as *Anastrepha unipuncta*, maggots of which had been found in ripe grapefruit and other citrus fruits. "Heat Sterilization of Mangoes and Guavas for Fruit Flies" (Jour. Agr. Univ. P. R., **19** (2): 105–115, ref. 3. Río Piedras, September 1935) "at a temperature of 43°C. for eight hours (with a minimum of four hours for complete effectiveness) in a circulating atmosphere saturated with moisture kills the eggs, maggots and pupae of the fruit flies that infest mangoes and guavas in Puerto Rico without unfavorably affecting the flavor, appearance or keeping qualities of the fruit if it is afterwards placed in refrigeration" was shown by his experiments. "A Revision of the Genus *Anastrepha* based on a Study of the Wings and on the Length of the Ovipositor Sheath (Diptera: Trypetidae)" (Proc. Ent. Soc. Washington, **36** (6): 127–179, pl. 5, ref. 36. Washington, D. C., July 9, 1934) by Mr. C. T. Greene, showed, however, that besides occurring in all of the Greater Antilles, many of the Lesser Antilles, Canal Zone, Central America and Mexico, this species also occurred in south Texas and at Key West, Florida. Dr. A. da Costa

Lima in "Moscas de Frutas do Genero *Anastrepha* Schiner 1868 (Diptera: Trypetidae)" (Instituto Oswaldo Cruz Mem. **28,** pp. 487–575, illus. Río de Janeiro, 1934) extends the distribution of "The West Indian Fruit Fly" to include Río de Janeiro, and Dr. Alan Stone (1942–68) by synonymy to include Trinidad, Venezuela and Ecuador, stating that it "occurs only rarely in *Citrus*, a few infestations having been found in grapefruit in Puerto Rico." Indeed, "A Study of the Adult Populations of the West Indian Fruitfly in Citrus Plantings in Puerto Rico" (P. R. Expt. Station Bulletin No. 41, pp. 16, ref. 9, fig. 1. Washington, D. C., December 1941) by Mr. L. C. McAlister Jr., Dr. W. A. McCubbin and Messrs. G. A. Pfaffman, W. T. Owrey, H. G. Taylor and I. W. Berryhill, indicated that "*Anastrepha mombinpraeoptans* has not been a citrus-breeding fruitfly under normal conditions in Puerto Rico."

Anastrepha suspensa (Loew), originally described from Cuba as an *Acrotoxa*, was re-described by Mr. Francisco Seín under the name *Anastrepha unipuncta*, the type from Río Piedras (1933–190), reared from maggots infesting guava (*Psidium guajava*), others from "pomarrosa" (*Eugenia jambos*) and the husks of "almendra" (*Terminalia catappa*); the fruits of "caimito" (*Chrysophyllum cainito*), "nispero" (*Sapota achras*), and "corazon" (*Annona reticulata*); more rarely, the fruit of kumquat (*Fortunella margarita*), sour orange, native and Valencia orange and grapefruit sporadically in the late spring and early summer. He differentiates it from *mombinpraeoptans* "by the dark spot on the suture between the metathorax (mesonotum) and the scutellum. The egg has no neck and is deposited entirely underneath the cuticle of the fruit." When the studies by Mr. C. T. Greene (1934–132) made identification certain, it was found that specimens in the U. S. National Museum had been collected in southern Florida. Dr. Alan Stone (1942–74) records occurrence in Hispaniola, and considers the *Anastrepha longimaculata* described by Mr. Greene (1934–146) from Jamaica a synonym, or at most a local race, of *Anastrepha suspensa*. Normally in Puerto Rico the females of this fruitfly oviposit in the fruits of guava and pomarrosa, and to a lesser extent in the husks of the tropical almond. Presumably it was this fly which is reported by Mr. R. H. Van Zwaluwenburg (1918–34) under the name of *Anastrepha fraterculus* in pomarrosa fruits at Maricao in July 1917. Its attack on economic hosts developed at a time when citrus fruit from the Río Grande valley in south Texas first began to come on the continental market in competition with grapefruit from Puerto Rico. The most unexpected low prices for early fruit caused practically all growers to attempt to keep their fruit on the trees as long as possible, rather than pick it while still green and ship to an expectant New York market in which previously they had experienced no competition. Such an unusual and enormous amount of dead-ripe

grapefruit presented an opportunity for infestation by this fruitfly which resulted in some fruit being attacked, with appreciable commercial injury in some few groves bordered by mango or pomarrosa trees. "Although *Anastrepha suspensa* has not been known to breed in mango fruits in Puerto Rico," it has "a peculiar habit of migrating over large areas into various trees, including mango and citrus," according to Mr. L. C. McAlister, Jr., Dr. W. A. McCubbin and others (1941–10). They conclude that "the quantity or number of citrus fruits with larval infestation has been entirely negligible from the commercial viewpoint." As this species of fruitfly also occurs in southern Florida, from the quarantine standpoint it could not legitmately be considered a menace to the citrus industry in other parts of the United States, to which it undoubtedly would have spread long ago had conditions there been suitable for its continued existence.

Xanthaciura insecta (Loew), originally described as a *Trypeta* from Cuba, and known to occur in the other Greater Antilles, was first collected in Puerto Rico by Dr. Gundlach, as identified by Herr Victor von Roeder. In cane fields on the north and west coasts it is often noted resting on the leaves of young ratoons: conspicuous, despite its small size, because of the brownish pictured wings, out of which narrow, clear triangular areas appear to be cut. Dr. C. H. Curran (1928–71) records it as an *Aciura* from San Juan to Mayagüez, and the mountains at Orocovis. Interceptions have been made at Naguabo. Prof. James G. Needham found it a common and important member of "An Insect Community which Lives in Flower Heads" of shepherd's needles (*Bidens pilosa*) in Florida (National Geographic Magazine, **90** (3): 340–356. Washington, D. C., September 1946), naming it the Bandwing. "This dainty little black-backed fly has big green eyes, drooping yellow antennae, and a row of stiff white bristles set across the rear of its head like a back comb. Its under parts and legs are clear yellow. Gleaming, resplendent wings are like banners, black from base to tip, with large transparent triangles of glassy clearness cut out of both front and rear margins. This fly behaves as if quite conscious of the elegance of its dress. It struts this way and that, making little vacillating turns, then stands momentarily flirting its wings, turning each like a fan, in a manner that recalls the actions of a girl model displaying the latest styles in a fashion show." The eggs are laid in the flowers, the maggots develop in the green seeds, sometimes four or five in a single head, the pupae being formed in the cavity left by the feeding of the larvae, and adults emerging seven days later.

Xanthaciura phoenicura (Loew), originally described as an *Aciura* from Brasil, and recorded from St. Vincent, was identified by Dr. J. M. Aldrich from interceptions in the metropolitan area, and resting on grass at Añasco.

Ensina humilis (Loew), originally described as a *Trypeta* from Cuba,

and known to occur in Jamaica, southern Florida and Mexico, was first identified from Puerto Rico by Herr Victor von Roeder: material collected by Dr. Gundlach. A little, light brown fly, with rounded clear areas in its pictured wings, it is not so common on the leaves of young ratoon cane along the north coast as it is in the lower hills of the interior, as at Corozal, Ciales and San Sebastián, where it is so abundant as to form an item in the food of the little grass lizard, *Anolis pulchellus*. It was intercepted in a grapefruit grove at Mayagüez by Mr. A. G. Harley. Dr. C. H. Curran (1928–70) lists it from many mountain localities under the name of *Ensina picciola* (Bigot), and Dr. Alan Stone now calls it **Paroxyna picciola** (Bigot).

Ensina peregrina Loew, described originally from Brasil, was listed from Puerto Rico as a *Tephritis* by Mr. D. W. Coquillett (1900–258), having been collected here by Mr. Aug. Busck.

Acrotænia testudinea Loew, originally described from Cuba, has been repeatedly intercepted in Puerto Rico, as identified by Mr. C. T. Greene, from Trujillo Alto, Bayamón, Orocovis, Arecibo and Rincón.

Trupanea dacetoptera Phillips, listed by Dr. C. H. Curran (1928–71) from the Island of St. Croix, was identified by him from Boquerón, specimens in the AMC collection. The same specimens, or others collected at Boquerón at the same time, were identified by Dr. J. M. Aldrich as *Trypanea daphne* Wiedemann, and others from Mayagüez. At Orlando, Florida, larvae mining in *Gnaphthalium obtusifolium* proved to be the immature stages of this fly.

Trupanea mevarna (Walker), originally described as a *Trypeta* from Florida, but occurring widely in the United States and Mexico, is listed by Dr. C. H. Curran only from Adjuntas. It is really quite common, Dr. J. M. Aldrich identifying as *Urellia solaris* Loew numerous specimens swept from malojillo at Pt. Cangrejos and found resting on young ratoon cane at San Sebastián. It is a little grey fly, with a single large brown blotch on the wing, from which splashes radiate to the edges. In Florida, the larvae of this fly have been found feeding in the flowers and tender tips of *Chrysopsis*.

Dyseuaresta melanogaster (Loew), described originally from Cuba as an *Euaresta*, was thus identified from Dr. Gundlach's collections in Puerto Rico by Herr Victor von Roeder. Dr. C. H. Curran (1928–73) lists "very many specimens from numerous localities in Porto Rico and adjacent islands," but it was subsequently intercepted only once in an orange grove at Maricao. It is a little grey fly with most of its wing brown, the "marginal cell with three hyaline spots," found most often on grass or low vegetation in grapefruit, orange or coffee groves back from the coast, in the lower hills of the interior.

Dyseuaresta mexicana (Wiedemann), listed as an *Euaresta* by Van Zwaluwenburg (P. R. 106), was "not seen" by Dr. C. H. Curran (1931–15), nor has it since been collected in Puerto Rico.

Dyseuaresta plesia was described by Dr. C. H. Curran (1928–71) as an *Euaresta* from a single headless female from Coamo, with wings of which the "marginal cell (has but) two hyaline spots," as shown by his accompanying illustration. Dr. Alan Stone considers this and *melanogaster* synonyms of *mexicana*.

Tetreuaresta obscuriventris (Loew) was identified by Dr. C. H. Curran (1928–73) from several Puerto Rican localities, and in the AMC collection from Cidra, Maricao and Las Marias. As identified by Mr. C. T. Greene, it has been collected by Dr. Luis F. Martorell on Mona Island.

Plagiotoma pura was described by Dr. C. H. Curran (1931–16) from a single male collected by Dr. W. A. Hoffman at Jájome Alto, "similar to *discolor* Loew (of Cuba) except that the abdomen is shining rusty-reddish with black lateral spots; length 4.0 mm." Dr. Stone places it in the genus **Tomoplagia.**

Blepharoneura fulvicollis Van der Wulp, described originally from Mexico, has been intercepted at Ponce by Mr. R. G. Oakley, as identified by Mr. C. T. Greene.

Tylidae (Micropezidae or Calobatidae)

Nerius cinereus was described by Herr Victor von Roeder (1885–348) from material collected in Puerto Rico by Dr. Gundlach, but has not since been found.

Micropeza limbata was described by Herr Victor von Roeder (1885–347) from flies collected by Dr. Gundlach in Puerto Rico, presumably at or near Mayagüez. Dr. C. H. Curran (1928–85) lists specimens, identified by Mr. E. T. Cresson, Jr., from Mayagüez to Adjuntas, and later determined others (1931–21) from Cidra and Maricao, and in the AMC collection from Las Marias. This fly was intercepted on flowers of orange at Adjuntas by Mr. R. G. Oakley.

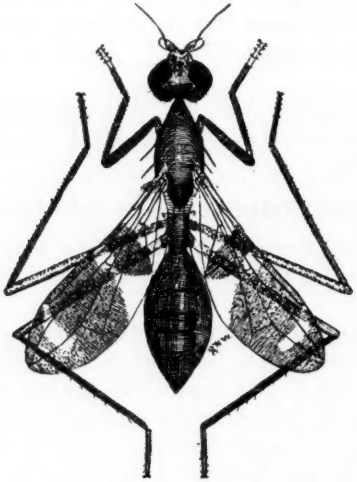
Systellapha scurra Enderlein has a chestnut-red head and thorax, black abdomen, wings clear except for distal angle and medio-distal quarter, and is often to be found in coffee groves in the mountains, as noted in "Insectae Portoricensis" (1923–230). Indeed, it is sufficiently common to form an item in the food of the crested lizard, *Anolis cristatellus*. Dr. C. H. Curran (1928–85) identifies it from Mayagüez and from other localities in the mountains, and (1931–21) from El Yunque, where it was collected by Prof. Wm. T. M. Forbes. It has also been intercepted on El Yunque, on orange flowers at Adjuntas and at Mayagüez.

Hoplocheiloma fasciata (Fabricius), to use the new name suggested by Mr. E. T. Cresson, Jr. (Trans. Amer. Ent. Soc., **52** (3): 249–274 (see p. 272). Philadelphia, 1926) for what was originally described as a *Musca* from the West Indies, was recorded from Puerto Rico by Mr. D. W. Coquillett (1900–257), having been collected by Mr. Aug. Busck, "on human excrement" as noted by Dr. L. O. Howard. Under the name *Calobata*,

as identified by Herr Victor von Roeder, Dr. Gundlach lists this fly as "común," and Dr. Stahl in his list calls it a *Taeniptera*. Dr. C. H. Curran (1928–85) identified a single specimen from Fajardo, and in the AMC collection, specimens from Mayagüez.

Calobata munda Van der Wulp, as identified by Mr. C. T. Greene, was intercepted resting on a grapefruit leaf at Añasco.

Taeniaptera lasciva (Fabricius), originally described as a *Musca* from Cayenne (French Guiana), repeatedly noted from Cuba as a *Calobata*, and found as far north as Philadelphia and southern New Jersey, was first



The Calobatid fly, *Taeniaptera lasciva* (Fabricius), six times natural size. (Drawn by G. N. Wolcott.)

recorded from Puerto Rico by Dr. Gundlach, as identified by Herr Victor von Roeder as a *Calobata*. Dr. Stahl lists it as a *Taeniaptera*, and this is the generic name used by Dr. C. H. Curran (1928–85) for his determinations, from Fajardo to Mayagüez. It is a common and very conspicuous fly in fields of young cane, with its long legs, white front feet and pictured wings. Larvae found in decayed cane cuttings and in dead, dry cane stalks, have been reared to adult. Despite the rapidity with which adults take flight when alarmed, they have been caught by the crested lizard, *Anolis cristalleus*, and form a minor item in its food. Sometimes adults are seen on cane leaves which do not take flight, and upon examinition it will be found that they have been killed by a fungus disease, and are so fragile

that insufficient material for identification of the fungus can not be collected even with the greatest of care. The flies have been intercepted on numerous other non-significant hosts than sugar-cane leaves, from numerous north coast points, and in smaller numbers are to be found on the south coast, as at Guayanilla. Indeed, one epidemic of the fungus disease occurred at Guayanilla in December 1938, the only other observed being at Canovanas in November 1936.

Clusiidae

Sobarocephala bivittata Melander and Argo, originally described from Costa Rica, has been identified by Dr. C. H. Curran (1931–22) from a pair collected by Dr. W. A. Hoffman at Dorado, both of which have the "scutellum wholly yellowish."

Sepsidae

Sepsis armata Schiner is identified by Dr. C. H. Curran (1928–74) from Aibonito, Adjuntas and Mayagüez. It, and the more abundant *S. pusio*, have been intercepted on cotton plants at Río Piedras.

Sepsis armillata Melander and Spuler is identified by Dr. C. H. Curran (1928–76) from many localities in Puerto Rico from Naguabo to Mayagüez.

Sepsis discolor Bigot, originally described from Cuba, was identified by Herr Victor von Roeder from material collected in Puerto Rico by Dr. Gundlach.

Sepsis furcata Melander and Spuler is doubtfully identified by Dr. C. H. Curran (1928–75) from Mayagüez and Arecibo.

Sepsis haemorrhoidalis Schiner is identified by Dr. C. H. Curran (1928–74) from localities in Puerto Rico from Naguabo to Mayaguez.

Sepsis pusio Schiner, first reported from Puerto Rico by Mr. D. W. Coquillett (1900–259) as *Sepsis insularis* Williston, is apparently the most "common and widely distributed species" of the genus, being identified by Dr. C. H. Curran (1928–76) from the U. S. Virgin Islands of St. Croix and St. Thomas, from many localities in Puerto Rico, and from Mona Island.

Sepsis simplex was described by Dr. C. H. Curran (1928–75) from a pair from Adjuntas, others from Arecibo and Naguabo (around horse manure).

Ephydridae

Ephydra gracilis Packard, as determined by Mr. David G. Hall, is one of "Two Insects New to Puerto Rico" (Jour. Agr. Univ. P. R., **21** (4): 535–8. Río Piedras, November 1937) now occurring in great abundance at the margins of the salt lagoons from Faro de Cabo Rojo to Parguera and Guánica, with larvae and pupae present in the concentrated salt water.

According to Mr. C. F. W. Muesebeck, "minor differences in color between the Puerto Rican specimens and those from the continent have been noted by Mr. Hall, but he found the male genitalia to match exactly, and believes that only a single species is involved." Dr. Stuart T. Danforth collected this fly as far back as 1926, but Dr. Aldrich and Dr. Curran identified his specimens only to genus. It was not noted by Mr. R. H. Van Zwaluwenburg at the time he was Entomologist at the Mayagüez Station, "and the great swarms of flies are so noticeable that it is hardly likely they would have escaped his observation if present here at that time." Dr. E. O. Essig (1926–608) notes that the fly is "2.3 to 3.5 mm. long, opaque grey, paler beneath and a slight green tinge above, and bright green legs marked with yellow. The larvae are somewhat transparent white, have eight pairs of long prolegs, and live suspended everywhere in the open water of Great Salt Lake, Utah, and Salton Sea, in salt water at San Francisco and adjacent to the Pacific Ocean at Laguna Beach, California. The fly was introduced from Great Salt Lake into San Francisco Bay by railroad trains after the building of the cut-off at the Lake, as described by Dr. J. M. Aldrich (Psyche, **25:** 30, 1918)." How the fly was carried from California to Puerto Rico in sufficient numbers to become established here is an unsolved problem. It has recently been noted by Mr. Otto H. Swezey as one of the "Insect Invaders in Hawaii during and since World War II" (Journal of Economic Entomology, **41** (5): 669–672. Menasha, October 1948), having been "first collected in a light-trap in the Pearl Harbor area in April, 1946. On July 23, it was found breeding in millions in salt-water ponds near the Moanalua Gardens in a suburban area between Honolulu and Pearl Harbor."

Notiphila erythrocera Loew, originally described from Cuba, was identified by Herr Victor von Roeder from Puerto Rico from material collected by Dr. Gundlach.

Notiphila furcata (Coquillett), originally described as a *Dichaeta* from Biscayne Bay, Florida, was identified by Mr. E. T. Cresson, Jr., (*in* Curran 1928–59) from San Juan, Puerto Rico and from Ensenada.

Notiphila virgata, described by Mr. D. W. Coquillett (1900–259) from Puerto Rico, was identified by Mr. E. T. Cresson, Jr., (*in* Curran 1928–59) from San Juan, Naguabo, Corozal and Adjuntas, and Dr. Curran identified specimens from Tortuguero Lagoon.

Discomyza dubia Williston, originally described from St. Vincent, was identified by Dr. C. H. Curran (1928–62) from the U. S. Virgin Islands of St. Croix and St. Thomas, and from Manatí in Puerto Rico.

Discomyza maculipennis Wiedemann, as identified by Dr. J. M. Aldrich, was intercepted on the hedge of "café de la India" (*Chalcas exotica*) around the Post Office building in San Juan, and on the SS "Catherine" in San Juan harbor.

Paralimna ciliata Cresson was identified by Mr. E. T. Cresson, Jr. (*in* Curran 1928–60) from San Juan, Aibonito and Coamo.

Paralimna decipiens Loew is recorded from Puerto Rico by Mr. D. W. Coquillett (1900–259), and from Georgia and Florida.

Paralimna obscura Williston, originally described from St. Vincent, is listed from Puerto Rico by Mr. Coquillett.

Paralimna plumbiceps Cresson was identified by Mr. E. T. Cresson, Jr. (*in* Curran 1928–60) from Adjuntas and Coamo.

Ptilomyia enigma was described by Mr. D. W. Coquillett (1900–261) from Puerto Rico, the type collected by Mr. Aug. Busck.

Hydrellia calverti Cresson was identified by Mr. E. T. Cresson, Jr. (*in* Curran 1928–60) from Naguabo, Arecibo, Adjuntas and Aibonito.

Hydrellia gilvipes was described by Mr. D. W. Coquillett (1900–261) from Puerto Rico, the type collected by Mr. Aug. Busck.

Pseudohecamede abdominalis (Williston), originally described as a *Hecamede* from St. Vincent and Brasil, was identified by Mr. D. W. Coquillett (1900–260) from Puerto Rico.

Psilopa skinneri Cresson was identified by Mr. E. T. Cresson, Jr. (*in* Curran 1928–60) from Naguabo, San Juan, Cayey, Jayuya and Mayagüez.

Psilopa unica Cresson was identified by its describer (*in* Curran 1928–60) from Adjuntas and Mayagüez, now by Dr. Wirth placed in synonymy with **pulchripes** Loew.

Ilythea fenestralis Cresson was identified by its describer (*in* Curran 1928–60), a single specimen from Aibonito.

Zero flavipes (Williston), originally described from St. Vincent, and also recorded from Brasil, was identified by Mr. D. W. Coquillett from Puerto Rico, and also **Ilythea oscitans** (Walker) as a distinct and valid species.

Athyroglossa nitida Williston, originally described from St. Vincent, is listed by Mr. D. W. Coquillett from Puerto Rico. It has been intercepted at Naguabo.

Hydrochamasa leucoprocta (Loew) was identified by Mr. D. W. Coquillett from Puerto Rico, and he described *Discocerina incisa* (Jour. N. Y. Ent. Soc., **10:** 182. New York, 1902) from type material collected here by Mr. Aug. Busck. Mr. E. T. Cresson, Jr. (Trans. Amer. Ent. Soc., **44:** 58. Philadelphia, 1918) considers the latter a subspecies of the former, and under the name **Discocerina leucoprocta** subspecies **incisa** Coquillett (*in* Curran 1928–62) lists flies collected at San Juan, Manatí, Coamo and Mayagüez.

Discocerina obscura Williston, originally described from St. Vincent, is identified from Puerto Rico by Mr. E. T. Cresson, Jr. (*in* Curran 1928–63): specimens from Naguabo, Cayey and Mayagüez. Dr. Wirth puts it in the subgenus (**Lamproclasiopa**).

Discocerina obscurella (Fallén), first identified from Puerto Rico by Mr.

D. W. Coquillett (1900–261) as *D. parva* Loew, is listed by Mr. E. T. Cresson, Jr. (*in* Curran 1928–63) from Mayagüez and Mona Island. Dr. Wirth considers it the subspecies **nitidiventris** Hendel.

Ceropsilopa adjuncta was described by Mr. E. T. Cresson, Jr. (Entomological News, **36** (6): 165. Philadelphia, 1925), the type from Adjuntas, others from Manatí, Arecibo and Naguabo, as noted in Cresson (1928–61).

Ceropsilopa coquilletti was described by Mr. E. T. Cresson, Jr. (Entomological News, **33:** 136. Philadelphia, 1922) from a single specimen collected on Mona Island by Dr. Frank E. Lutz, as noted in Curran (1928–61).

Ceropsilopa mellipes was described by Mr. D. W. Coquillett (1900–260) as a *Psilopa* from Puerto Rico, the type collected by Mr. Aug. Busck. This fly was later identified by Mr. E. T. Cresson, Jr. (*in* Curran 1928–61) from Naguabo, Adjuntas and Arecibo.

Typopsilopa flavitarsis Cresson, originally described from Bill Williams Fork, Arizona, is recognized by its describer (*in* Curran 1928–61) from Mayagüez and Arecibo.

Leptopsilopa nigrimana (Williston), originally described as *Psilopa nigrimana* Williston from St. Vincent and Brasil, is recognized by Mr. E. T. Cresson, Jr. (*in* Curran 1928–61) from many Puerto Rican localities and from Desecheo Island. It has been intercepted at Bayamón.

Plagiopsis aciculata (Loew), originally described as a *Psilopa* from Cuba, and recorded from St. Vincent and Brasil, was listed by Mr. D. W. Coquillett (1900–260) from Puerto Rico, and was recognized by Mr. E. T. Cresson, Jr. (*in* Curran 1928–62) from many Puerto Rican localities and from Mona Island.

Parathyroglossa centralis (Cresson) is recognized by its describer (*in* Curran 1928-63) from Mayagüez and San Juan.

Anthyroglossa laevis (Cresson) is recognized by its describer (*in* Curran 1928–63) from many Puerto Rican localities.

Chloropidae or Oscinidae: Frit Flies, "Mimis."

The elongate, brownish-green, scale-like larvae of some species of Chloropid fly of which the adult has not been reared, is sometimes to be found on the leaves of young sugar-cane, specimens collected at Guánica having been identified by Mr. C. T. Greene as "near *Meromyza.*" They have been noted in all parts of the Island, but never in abundance.

Chloropisca atra was described by Dr. C. H. Curran (1926–3) from a single female from Arecibo, 2.6 mm. long, with "largely pale colored legs."

Chlorops trivittata Williston, originally described from St. Vincent, was listed by Mr. D. W. Coquillett from Puerto Rico.

Cadrema pallida (Loew), originally described as an *Hippelates* from Cuba, is identified by Dr. C. H. Curran (1928–45) from a single specimen collected by Dr. Frank E. Lutz on Mona Island.

Hippelates apicata, described from Puerto Rico by Mr. J. R. Malloch in "The Genera of Flies of the Subfamily Botanodiinae with hind tibial Spur" (Proc. U. S. National Museum, **46** (2024), pp. 242–55. Washington, D. C., December 6, 1913) on p. 248, is recognized by Dr. C. H. Curran (1928–50) from Mona Island.

Hippelates bicolor Coquillett, originally described from Lake Worth, Florida, is identified by Dr. C. H. Curran (1928–49) from St. Thomas, Manatí in Puerto Rico, and from Mona Island.

Hippelates convexus Loew, originally described from Cuba, is first reported from Puerto Rico by Mr. D. W. Coquillett (1900–265), who (Bulletin No. 10, new series, Division of Entomology, pp. 70–79. Washington, D. C., 1898) notes that the larvae of this little fly occur in burrows in sugar-cane in Florida. Its occurrence in Puerto Rico is recorded by Mr. J. R. Malloch (1913–249), and Dr. C. H. Curran (1928–48) lists it from St. Thomas, from many localities in Puerto Rico, and from Mona Island.

Hippelates collusor was described by Dr. D. H. Curran (1926–4) from a single female from St. Thomas, others from Manatí, Puerto Rico, and from Mona Island. It is 1.5 to 2.0 mm. long, "allied to *bicolor* Coquillett (which) has a much longer vertical triangle."

Hippelates dorsatus Williston, originally described from St. Vincent, is recognized by Dr. C. H. Curran (1928–46) from Mona Island: three specimens collected by Dr. Frank E. Lutz.

Hippelates flavipes Loew, originally described from Cuba, was first identified from Puerto Rico by Mr. D. W. Coquillett (1900–265), and listed by Mr. R. H. Van Zwaluwenburg as number 1712. Dr. C. H. Curran (1928–49) identifies it from the Island of St. Thomas, from San Juan, Arecibo and Orocovis in Puerto Rico, and from Mona Island, and (1931–11) from Vieques Island. He also identified as *H. partitus* Becker, which is the male of *H. flavipes* Loew, a single specimen from Aibonito (1928–48), and subsequently (1931–11) a male from Vieques Island collected by Prof. Wm. T. M. Forbes. It has been intercepted in San Juan, resting on the hedge of "café de la India" (*Chalcas exotica*) around the Post Office building. *Hippelates nudifrons*, described by Mr. J. R. Malloch (1913–242), the type from Puerto Rico and from Vieques Island, is another synonym.

Hippelates ilicis was described by Dr. C. H. Curran (1926–4) from a male from Arecibo, Puerto Rico, others from Manatí, and additional specimens from St. Thomas. It is 1.5 to 2.0 mm. long, "colored as in *apicata* Malloch (of which Mr. Sabrosky considers it a synonym), but the mesonotum is less hairy."

Hippelates incipens was described by Dr. C. H. Curran (1926–5) from a female from Naguabo, another from Coamo Springs, Puerto Rico.

Hippelates impressus Becker was identified by Dr. C. H. Curran (1928–

47) from fourteen specimens collected on the Island of Desecheo, February 18–20, 1914, by Dr. Frank E. Lutz.

Hippelates lutzi was described by Dr. C. H. Curran (1926–5) in honor of its collector, Dr. Frank E. Lutz; the types from Mona Island, February 21–26, 1914. It may be "readily recognized by the entirely pale yellow abdomen and legs, face, cheeks and front reddish-yellow; thorax and scutellum shining black; legs and abdomen wholly pale yellow; wings hyaline, veins yellow."

Hippelates nigricoxa Malloch was identified by Dr. C. H. Curran (1928-48) from St. Thomas, and from many localities in Puerto Rico.

Hippelates nobilis Loew, a continental species, was identified by Dr. C. H. Curran (1928–48) from Arecibo, Aibonito and Adjuntas.

Hippelates pallipes Loew, as determined by Dr. J. M. Aldrich, together with **Hippelates pusio** Lew, also determined by Dr. Aldrich, are reported by Dr. H. L. Van Volkenberg (1939–4) as "common on cattle and other animals. Apparently these two species are the most common of the *Hippelates* attracted to cattle and other livestock," altho only a single collection, recorded as Bishopp No. 18780, was made on which to base this statement. Previous identification by Dr. Aldrich of material collected at Guánica, from dogs, horses and man, was *Hippelates texanus* Malloch, but even this may not include all the species lumped together under the term "mimi" to designate the tiresome and annoying little black flies which tend to swarm at every body opening of the larger mammals, at wounds and sores, and even often coming to rest on any part of the body of a sweaty horse or its rider. Not entirely absent in the more humid parts of the Island or in the mountains, they become very numerous in the more xerophytic areas, and most active during the hottest and brightest part of the day. They even enter houses, and may be excluded only when the shutters are kept closed (incidentally also cutting out the breeze), so that the inhabitants live in semi-darkeness when the sun is shining most brightly outside. At Haina, Santo Domingo, mimis, identified by Dr. J. M. Aldrich as *Hippelates flavipes* Loew, entered the room within a few minutes after the sun rose, and were excluded by closing the shutters and keeping them closed until a few minutes before sunset. Mr. C. W. Sabrasky states that *H. pallipes* does not occur in Puerto Rico and all records under that name are probably **Hippelates flavipes** Loew. *Hippeoates texanus* is a synonym of *H. dissidens* (Tucker), but he doubts the occurrence of this species in Puerto Rico.

Hippelates pusio Loew, originally described from Texas, but noted by Mr. D. W. Coquillett (1900–265) as occurring "as far north as New Bedford, Mass." as well as in Puerto Rico, is listed by Dr. C. H. Curran (1928-49) as having been collected only at Arecibo, Adjuntas, Ensenada and on

Mona Island. This species and *Hippelates flavipes* Loew are cited by Dr. E. A. Schwarz in "The Hippelates Plague in Florida" (Insect Life, VII, p. 374–9, illus. Washington, D. C., July 1895) as most annoying to people and dogs.

Hippelates peruanus Becker is first recorded from Puerto Rico by Mr. J. R. Malloch (1913–244). Dr. C. H. Curran (1928–49) recognizes it from St. Croix, in Puerto Rico from San Juan, Arecibo, Jayuya and Adjuntas, and (1931–11) from Vieques Island.

Hippelates scutellaris Williston, originally described from St. Vincent, is represented in the collections examined by Dr. C. H. Curran (1928–47) by a single specimen from Adjuntas.

Hippelates tener was described from Puerto Rico by Mr. D. W. Coquillett (1900–265), and was noted by Mr. J. R. Malloch (1913–255). Dr. C. H. Curran (1928–47) lists but a single specimen from Arecibo, and one from Mona Island.

Eugaurax insularis was described by Mr. J. R. Malloch (Insecutor Inscitiae Menstruus, **1:** 61. 1913) from specimens from Puerto Rico previously reported by Dr. D. W. Coquillett as *Oscinis qudrilineata* Williston, according to Mr. C. W. Sabrosky (Jour. Washington Academy of Sciences, **40** (6): 188. June 15, 1950).

Pseudogaurax lancifer was described by Mr. D. W. Coquillett (1900–265) as a *Gaurax* from Puerto Rico and the Island of Montserrat, reared from the egg-sacs of spiders. Those of *Gasteracanthia cancriformis* covered with greenish silk served as host at Pt. Cangrejos and Río Piedras, and possibly may have been the species from which the type was reared. These little yellow flies, with enormous scuttelum, have brown eyes and abdomen, and median stripe from base of thorax. One was intercepted resting on a guava leaf at Barceloneta.

Pseudogaurax misceomaculata was described by Mr. David G. Hall as one of "The North and Central American spider parasites of the genus *Pseudogaurax* (Diptera: Chloropidae)" (Jour. Washington Academy Sciences, **27** (6): 255–261, fig. 7. Washington, D. C., June 15, 1937) from a single specimen intercepted at Bayamón by Mr. C. G. Anderson, January 28, 1934, on leaves of flamboyán. It has a broad median band on thorax extending to apex.

Elachiptera flavida Williston, described originally from St. Vincent, was recognized by Dr. C. H. Curran (1928–50) from Puerto Rico: a single female from Cayey.

Madiza mattea was described by Dr. C. H. Curran (1926–5) from a single male from Adjuntas, 1.25 mm. long, of which "the vertical triangle reaches the anterior margin of the front and the tibiae are pale."

Madiza quinquilineata (Adams) is recognized, with some doubt, by Dr.

C. H. Curran (1928–50) from St. Thomas, and Manatí and Coamo in Puerto Rico.

Siphunculina signata (Wollaston) as determined by Dr. J. M. Aldrich, was intercepted in the metropolitan area of San Juan.

Oscinella anonyma (Williston), originally described as an *Oscinis* from St. Vincent, was listed from Puerto Rico by Mr. D. W. Coquillett from various localities, and Dr. C. H. Curran (1928–54) doubtfully identifies it from Naguabo, Cayey, Manatí and Arecibo.

Oscinella anonyma var. **pura** was described by Dr. C. H. Curran (1926–7) as a *Botanobia* from a single male from San Juan, and another from Roseau, Dominica, B. W. I., with (1928–52 and 54) the head and wing illustrated.

Oscinella confusa (Malloch) is recognized and re-described by Dr. C. H. Curran (1928–55) from females from Cayey and Mayaguez, as a *Botanobia*.

Oscinella diversipes is described as a *Botanobia* by Dr. C. H. Curran (1926–7) from a male and others from Arecibo, 1.75 mm. long, with "wholly yellow anterior femora."

Oscinella forbesi was described by Dr. C. H. Curran (1931–12) and named in honor of the collector: Prof. Wm. T. M. Forbes, from a pair and many others from Vieques Island, besides others from the Island of St. Thomas, and many from the humid areas of Puerto Rico. This fly is distinct from *O. coxendix* Fitch, recorded from Puerto Rico by Mr. D. W. Coquillett (1900–266) and "from New Hampshire to Florida and westward to Colorado." According to Dr. Curran it "does not occur on the Islands." *O. forbesi* is 1.1 to 1.5 mm. long, "black, the head and legs largely yellowish; mesonotum wholly pollinose, ocellar triangle pollinose."

Oscinella limitata Becker, originally described from Haiti, is recognized by Dr. C. H. Curran (1928–53) from the Island of St. Thomas, from many localities in the more humid and mountainous parts of Puerto Rico, and from Mona Island.

Oscinella lutzi was described as a *Botanobia* by Dr. C. H. Curran (1926–6) from a single male from Arecibo, and others from there and Adjuntas.

Oscinella mars was described by Dr. C. H. Curran as a *Botanobia* (1926–10) from flies collected at Naguabo, others from Mona Island. The head is illustrated (1928–53) and the wing (1928–57), with no record of additional collections.

Oscinella mona was described as a *Botanobia* by Dr. C. H. Curran (1926–9) from 23 specimens collected by Dr. Frank E. Lutz on Mona Island, and to date found nowhere else, the subsequent notice (1928–56) being accompanied only by figures of the head and wing.

Oscinella magnipalpoides was described as a *Botanobia* by Dr. C. H.

Curran (1926–11) from a pair from Arecibo, others from San Juan, his later notice (1928–57) merely accompanying figures of head and wing.

Oscinella nana (Williston), described as an *Oscinis* from St. Vincent, is identified from Puerto Rico by Mr. D. W. Coquillett (1900–267).

Oscinella obscura (Coquillett), described (1900–266) from Puerto Rico, the type collected by Mr. Aug. Busck, is recognized by Dr. C. H. Curran (1928–56) from Naguabo, San Juan and Manatí, having black palpi, "wholly yellow anterior four tibiae."

Oscinella palliata was described as a *Botanobia* by Dr. C. H. Curran (1926–8) from eight specimens from Adjuntas, 2.5 to 3.0 mm. long, the legs reddish, "wings with a slightly brownish tinge."

Oscinella plesia was described by Dr. C. H. Curran (1926–11) as a *Botanobia* from a single female from Arecibo, 1.6 mm. long.

Oscinella sicatrix was described as a *Botanobia* by Dr. C. H. Curran (1926-8) from seventeen reddish-brown flies from Mona Island collected by Dr. Frank E. Lutz, which, on the posterior tibiae "bear an unusually conspicuous, elongate sensory area." Later mention (1928–56) is accompanied by figures of head and wing.

Oscinella tripunctata was described as a *Botanobia* by Dr. C. H. Curran (1926-10) from three flies collected by Dr. Frank E. Lutz on Mona Island. His later record (1928-56) accompanies figures of head and wing.

Oscinella umbrosa (Loew), a continental species reared from wheat, and reported from Puerto Rico by Mr. D. W. Coquillett (1900–267), and *Oscinella virgata* (Coquillett), originally described as an *Oscinis* from Colorado, also recognized by the describer from Puerto Rico, may presumably be referred to some of the numerous endemic species since described by Dr. Curran.

Oscinella varipalpus was described by Dr. C. H. Curran (1926-12) as a *Botanobia* from three black flies, 1.75 mm. long, from Mona Island, and one from San Juan, Puerto Rico. His later record (1928–28) is accompanied by figures of wing and head.

Asteiidae

Crepidohamma bicolor (Loew), originally described as a *Sigaloëssa* from Cuba and thus listed from Puerto Rico by Mr. D. W. Coquillett (1900–267), has been intercepted resting on banana at Bayamón. Its mesonotum and front are wholly shining black.

Crepidohamma rica (Curran) (= *Sigaloëssa insularis* Curran 1931, not Malloch 1930) was described from a single female collected by Prof. Wm. T. M. Forbes on Vieques Island, 1.5 mm. long, "brownish red or pale ferrugineous and yellow."

Drosophilidae: Pomace Flies

Drosophila ananassas de Meijere was identified by Dr. J. T. Patterson for Dr. G. A. Lebedeff, who collected this material from banana fruit. Dr. Lebedeff, previous to his employment in the Division of Genetics, Agricultural Experiment Station at Río Piedras, had worked extensively in the genetics of Drosophilid flies, and upon arrival in Puerto Rico, collected material for identification. This is the only new record for Puerto Rico of what he submitted for determination.

Drosophila ampelophila Loew, described originally from Cuba, but found in Europe, north Africa and in the United States, where it is called by Prof. John R. Comstock "the vine-loving pommace fly," the larvae developing in apple pommace or decaying applies, has been repeatedly intercepted in Puerto Rico, as identified by Mr. C. T. Green, on banana at Maricao, on guava at Arecibo, and on non-significant hosts in the metropolitan area. It has been reared from ripe fruit of "jobo" or hog-plum (*Spondias mombin*) at Río Piedras. Dr. Wirth places it in synonymy with **melanogaster** Meigen.

Drosophila funebris (Fabricius), originally described as a *Musca* from Europe, was recorded by Mr. D. W. Coquillett (1900-264) from Puerto Rico and "over the greater portion of the United States."

Drosophila fusca was described by Mr. D. W. Coquillett (1900-264) from material collected in Puerto Rico by Mr. Aug. Busck. It is probably **lutzii.**

Drosophila lutzi Sturtevant was identified by Dr. C. H. Curran (1928-64) from Puerto Rico, the material he examined containing more than thirty specimens from the Luquillo National Forest.

Drosophila melanica Sturtevant, as identified with some doubt by Mr. C. T. Greene, was intercepted by Mr. R. G. Oakley at Adjuntas.

Drosophila melanogaster Meigen was first listed from Puerto Rico by Mr. H. H. Van Zwaluwenburg as P. R. 110. Dr. Richard T. Cotton reared these flies from fallen and decaying oranges at Río Piedras, as identified by Dr. J. M. Aldrich, and Dr. J. A. Patterson identified as this species the material submitted by Dr. G. A. Lebedeff, collected on banana fruit.

Drosophila repleta Wollaston, identified by Mr. C. T. Greene, as *D. punctulata* Loew, has been intercepted in the metropolitan area, reared from ripe and rotting fruit of "jobo" or hog-plum (*Spondias mombin*).

Drosophila repleta Wollaston was first identified from Puerto Rico by Dr. C. H. Curran (1928-64): two specimens from Santurce: later, others in the AMC collection from Mayagüez, Coamo and Río Piedras It has

been intercepted in grapefruit groves at Palo Seco and Añasco, and reared from a ripe fruit on the tree in a grove at Barceloneta.

Drosophila similis Williston is one of the many of this genus described from St. Vincent which occurs in Puerto Rico, Dr. C. H. Curran identifying specimens from Mayagüez in the AMC collection.

Dr. J. M. Aldrich identified only to "sp. nov." the *Drosophila* reared from the ovary of the flower of "tibéy" (*Isotoma longiflora*), at Río Piedras and intercepted at Vega Baja.

Scaptomyza vittata (Coquillett), described as a *Drosophila* from Charlotte Harbor, Florida, was recognized by the describer as present in Puerto Rico (1900-264), and has since been intercepted at Vega Baja, resting on squash.

Cladochaeta nebulosa was described from Puerto Rico by Mr. D. W. Coquillett (1900-263), the type collected by Mr. Aug. Busck.

Leucophenga frontalis (Williston), described originally as a *Drosophila* from St. Vincent, was identified by Dr. C. H. Curran from Puerto Rico: specimens in the AMC collection from Coamo Springs, Río Piedras and Mayaguez.

Leucophenga varia (Walker), a continental species originally described as a *Drosophila* from Georgia, was identified from Puerto Rico by Mr. C. T. Greene, resting on a leaf of young sugar-cane at Coloso.

Geomyzidae

Anthomyza nigrimanus was described by Mr. D. W. Coquillett (1900-264) from Puerto Rican material collected by Mr. Aug. Busck. Dr. J. M. Aldrich identified as a new species of *Tethina* a fly intercepted at San Juan.

Stenomicra angustata was described by Mr. D. W. Coquillett (1900-262) from material collected by Mr. Aug. Busck in Puerto Rico, but has not since been noted.

Agromyzidae: Leaf-Mining Flies

Agromyza caerulea Malloch is presumed by Dr. J. M. Aldrich to be the *Agromyza aeneiventris* Fallén reported from Puerto Rico by Mr. D. W. Coquillett (1900-268). *Agromyza aeneiventris* Fallén is the doubtful determination by Mr. C. T. Greene of flies very persistent in resting on the leaves of "cucubano" (*Coccoloba laurifolia*) on Mona Island. It has since been intercepted in the common "margarita" or shepherd's needles (*Bidens pilosa*) from Guayama, and reared from the stem of *Eupatorium odoratum* and from seeds of morning glory by Dr. Richard T. Cotton. Messers. W. K. Bailey and H. K. Plank report it as "An Agromyzid Fly Infesting Sweet Potato Seed in Puerto Rico" (Jour. Ec. Ent., **33** (4): 704–5. Menasha,

August 1940), attacking the true botanical seed; not slips or small tubers, and so rarely (less than 2% infestation) as hardly to be of economic importance even to the plant breeder.

Agromyza ipomaeae was described by Prof. S. W. Frost as one of "New Species of West Indian Agromyzidae (Diptera)" (Entomological News, **43** (3): 72-6. Philadelphia, March 1931), the type from Puerto Rico: the larva a miner in the leaves of sweet potatoes. Dr. M. D. Leonard (1931-119, 1932-137, 1933-123) noted the presence of this leaf-miner in all fields of sweet potatoes examined, but not in sufficient abundance to be of economic importance.

Agromyza inaequalis was described by Mr. J. R. Malloch (Proc. Ent. Soc. Washington, **16** (2): 89–90, fig. 1. Washington, D. C., June 1914) from material reared by Mr. Thos. H. Jones from leaves of beans (*Vigna repens*) at Río Piedras. This leaf-miner also attacks the leaves of lima beans and Dr. M. D. Leonard (1932-124) reports a leaf-miner, probably this species, as fairly common on cabbage plants grown at Río Piedras in April.

Agromyza insularis Malloch, as determined by Dr. J. M. Aldrich, was reared by Dr. Richard T. Cotton from seed pods of Chinese mustard.

Agromyza jucunda Van der Wulp, a common continental leaf-miner, was listed by Mr. D. W. Coquillett from numerous hosts in the United States, and without host record from St. Vincent and Puerto Rico. It was identified by Mr. J. R. Malloch for Mr. Thos. H. Jones from adults reared from mined leaves of *Eupatorium odoratum*, and from leaves of wild morning glory intercepted at Vega Alta. Adults have been found resting on the hedge of "café de la India" (*Chalcas exotica*) around the Post Office in San Juan, and intercepted at Guayama, and at Mayagüez in a grapefruit grove.

Agromyza maculosa Malloch was identified by Dr. C. H. Curran (1928-65) from numerous localities in Puerto Rico from Cayey to Ensenada, and specimens from Mayagüez in the AMC collection. Young aster plants, grown from imported seed by Mr. Francisco Seín, had their small leaves almost entirely destroyed by the mines of this species, as determined by Dr. J. M. Aldrich: a record mentioned by Prof. S. W. Frost (1931-76). More recently the leaves of sunflower, *Helianthus annus*, at La Plata, have been found attacked by it.

Agromyza melampyga Loew, a common continental species, was identified by Dr. C. H. Curran (1928-65) from Naguabo and Arecibo.

Agromyza minima was described by Mr. J. R. Malloch in his "Revision of Species of Agromyza" (Ann. Ent. Soc. America, **6** (3): 329. Columbus, 1913), the type from Puerto Rico.

Agromyza neptis Loew was listed from Puerto Rico by Mr. D. W. Coquillett.

Agromyza parvicornis Loew was determined by Mr. W. R. Walton for Mr. Thos. H. Jones, who had reared the adults from mines in the leaves of corn: a record that is noted by Prof. S. W. Frost (1931-36). Dr. C. H. Curran (1928-66) identified a single adult collected at Adjuntas.

Agromyza platyptera Thomson, described originally from California, was identified by Dr. C. H. Curran (1928-65) from Naguabo and Jayuya.

Agromyza plumiseta was described from Puerto Rico by Mr. J. R. Malloch (1913-324).

Agromyza pusilla Meigen was listed from Puerto Rico by Mr. D. W. Coquillet as *Agromyza diminuta* Walker, and has since been repeatedly intercepted: reared at Cidra from larvae mining in pea leaves; at Humacao from larvae in leaf of "cohitre" (*Commelina longicaulis*); at Guayama from flower heads of "margarita" (*Bidens pilosa*). In the Island of St. Croix and St. Thomas, and in Haiti, this leaf-miner is a common pest of onions, making a tunnel that appears light-colored or yellowish part way around the stalk and then irregularly up or down, but not causing irreparable injury unless several or many maggots are present in the single central stalk. Much more severe injury occurs in Chinese cabbage or Chinese mustard, in some instances the entire under surface of the larger outer leaves being destroyed by mass infestations. Mr. Charles E. Wilson, from his experience with the "Truck-Crop Insect Pests in the Virgin Islands and Methods for Combating Them" (Bulletin No. 4, Virgin Islands Agr. Exp. Station, pp. 35, fig. 23. Washington, D. C., 1923), named this the "Mustard Leaf-Miner," and records that "on January 31, 1921, 2,128 larvae were taken from one leaf of elephant-ear mustard. The full-grown worm is of pale yellow color, very active, and when ready to pupate, drops to the ground from the leaf in which it has been feeding. The pupa is small and of light yellowish-brown color." He found the only method of satisfactory control was to pick and destroy such mass-infested leaves. Surprisingly enough, no injury of any of these economic hosts has been noted by this Agromyzid fly in Puerto Rico.

Agromyza setosa Loew is listed from Puerto Rico by Mr. D. W. Coquillett.

Agromyza virens Loew is identified by Dr. C. H. Curran (1928-65) from many Puerto Rican localities from Naguabo to Mayagüez, and from the Virgin Islands of St. Thomas and St. Croix. It has repeatedly been intercepted at Mayagüez.

Agromyza viridula was described from Puerto Rico by Mr. D. W. Coquillett as one of "New Acalyptrate Diptera from North America" (Jour. N.

Y. Ent. Soc., **10:** 190. New York, December 1902). It was recognized by Dr. C. H. Curran (1928-66) from the U. S. Virgin Islands of St. Croix and St. Thomas, and from numerous localities in Puerto Rico. It has been intercepted at Guayama, and at numerous localities in the mountains and on the north coast of Puerto Rico.

Agromyza xanthophora Schimer, as determined by Dr. J. M. Aldrich, has been intercepted in an orange grove at Mayagüez by Mr. A. G. Harley.

Cerodontha dorsalis (Loew), originally described as an *Odontoera* in the United States, a miner in wheat and timothy, was listed from Puerto Rico as a *Ceratomyza* by Mr. D. W. Coquillett (1900-269), and subsequently identified by Mr. J. R. Malloch for Dr. Richard T. Cotton, who had reared adults from mines in the leaves of corn. Altho quite common it is of negligible importance as an economic pest, presumably being heavily parasitized as are the other Agromyzid flies.

"*Cryptochaetum iceryae* (Williston) was one of the natural enemies of *Icerya purchasi* Maskell introduced by F. S. Crawford and Albert Koeble from Australia into California in 1888–9. The adults are 1.5 mm. long, the head and thorax metallic dark blue, and the abdomen iridescent green. They are rather slow in movement, crawling slowly over the cottony cushion scale, inserting one to several minute, oblong, oval, smooth, pearly white eggs preferably in the half grown hosts," according to Dr. E. O. Essig (1926-615). An unsuccessful attempt at introduction of this parasite of the cottony cushion scale into Puerto Rico was made shortly after the hurricane of San Ciprián, its failure being ascribed to the scarcity of the host at this time. Another sending by airmail from Riverside, California, October 31, 1933, was received in good condition at Río Piedras on November 7th, from which adults were released as they emerged, in the Condado. No recovery was obtained from subsequent weekly collections of the host. From a shipment made March 25, 1940 from Whittier, California, received in Río Piedras on the 28th, and taken to Mona Island on the 29th, releases were made daily until April 5th, and all adults emerging subsequently were released at Río Piedras. From numerous collections of *Icerya purchasi* at Río Piedras and in other parts of Puerto Rico, and from Mona Island, no adult of this introduced parasite has been reared.

Chamaemyiidae (Ochthiphilidae)

Leucopis bella Loew, originally described from Cuba, but with an extensive distribution in the United States and southern Canada, was listed by Mr. D. W. Coquillett (1900-269) from Puerto Rico, reared by Mr. Aug. Busck from larvae feeding on the mealybugs *Dactylopius citri*. Mr. D. L. Van Dine reared several of these small grey flies from *Pulvinaria psidii* Maskell, a mealybug on "jobo" (*Spondias mombin*) at Arroyo, in February

1912. A single fly was collected by Prof. Wm. T. M. Forbes on Vieques Island, as identified by Dr. C. H. Curran (1931-13), who notes that the larvae are predaceous on aphids and mealybugs, and may be recognized by their triangular shape.

Acrometopia maculata Coquillett, originally described from Cuba, was identified by Dr. C. H. Curran (1928-66): seven specimens collected by Dr. Frank E. Lutz on Mona Island.

Milichiidae

Eccoptomma montanum Becker, originally described from Perú, is identified by Dr. C. H. Curran (1928-66) from Puerto Rico: a single male from Mayagüez. It is 2.5 mm. long, "black; abdomen argenteous except the base and apex."

Milichiella arcuata (Loew), originally described as a *Milichia* from Long Island, New York, was identified by Dr. C. H. Curran from a single male, collected by Dr. Frank E. Lutz on Desecheo Island.

Milichiella cinerea was described as an *Ophthalmomyia* from Puerto Rico by Mr. D. W. Coquillett (1900-268), the type material having been collected by Mr. Aug. Busck.

Milichiella lacteipennis (Loew), originally described as a *Lobioptera* from Cuba, and listed as an *Ophthalmomyia* from St. Vincent and by Mr. D. W. Coquillett (1900-267) from Puerto Rico, is considered by Dr. C. H. Curran (1928-67) to "agree perfectly with Coquillett's description of *Desmometopa halteralis* (1900-267)," and of it he recognizes specimens from San Juan, Manatí, Adjuntas and Mayagüez in Puerto Rico, and from Desecheo and Mona Islands collected by Dr. Frank E. Lutz. Prof. Wm. T. M. Forbes collected this fly on Vieques Island, as identified by Dr. Curran (1931-14), and it has been intercepted resting on eggplant at Loíza, and on the hedge of "café de la India" (*Chalcas exotica*) around the Post Office building in San Juan.

Desmometopa M-nigrum (Zetterstedt), originally described as an *Agromyza*, was identified by Dr. C. H. Curran (1928-68): a single specimen from Jayuya. It has been intercepted on leaves or flowers of grapefruit at Mayagüez and Arecibo, and also found resting on the hedge of "café de la India (*Chalcas exotica*) around the Post Office building at San Juan. As identified by Mr. C. T. Greene, it was found dead on the window-sill of the cotton gimmery at Isabela after its interior had been sprayed with DDT.

Desmometopa tarsalis Loew, described originally from Cuba, was recognized by Dr. C. H. Curran (1928-68): a single specimen collected by Dr. Frank E. Lutz on Desecheo Island.

Pholeomyia indecora (Loew), originally described as a *Lobioptera* from

Cuba and listed as a *Milichia* by Mr. D. W. Coquillett (1900-263) from Puerto Rico and the United States "ranging from New Hampshire to Georgia," is recognized by Dr. C. H. Curran (1928-68): a single female from Mayagüez and a single female from Mona Island.

Hippoboscidae: Birdflies or Louseflies

Melophagus ovinus (Linnaeus), originally described as a *Hippobosca* from domestic sheep in Europe, was P. R. 91 in Van Zwaluwenburg's list, presumably having been collected on a recently imported sheep. It has not been noted since, but there can be little doubt as to the authenticity of the original record.

Ornithoctona erythrocephala (Leach), originally described as an *Ornithomyia* from Brasil, without host record, is listed by Dr. Stahl as *Ornithomyia cryptocephala* Leach, and by Dr. Gundlach as *Ornithomyia erthrocephala* Leach, as identified by Herr Victor von Roeder, noting that "se encuentra en aves de diferentes familias". It was collected on sparrow hawk by Mr. Aug. Busck at Adjuntas, and on Culebra Island, as noted by Mr. D. W. Coquillett (1900-269). Dr. C. W. Johnson (Psyche, **29**: 84 Cambridge, 1922) also reports it on this host from Puerto Rico. In the AMC collection, as identified by Dr. C. H. Curran, are specimens from Lajas, and from W. I. red-tailed hawk at Las Marías. Dr. J. E. Bequaert in his "Notes on Hippoboscidae. 17. The Hippoboscidae of the Antilles" (Memorias de la Sociedad Cubana de Historia Natural, **14** (4): 305-327. Habana, December 31, 1940), on page 316 gives additional records: at Adjuntas from *Otus nudipes nudipes* (H. E. Anthony); at Parguera from *Asio flammeus portoricensis* (M. Agrait), and at El Yunque, from *Buteo platypterus cubanensis*.

Olfersia aenescens C. G. Thomson, originally described without host record from the Keeling Island in the Indian Ocean, was first identified from Puerto Rico by Dr. J. M. Aldrich as *Olfersia diomedeae* Coquillett, taken from a booby from Desecheo Island on May 1927, by Dr. Stuart T. Danforth. It was subsequently listed by Dr. J. Bequaert (Psyche, 40: 103. Cambridge, 1933) as *Olfersia erythropsis* Bigot, and correctly (1940-320), with the note that it is "almost cosmopolitan in tropical seas, found on various marine birds, particularly albatross, tropic bird, booby, petrel, noddy and tern."

Olfersia fossulata Macquart, originally described from Brasil without host record, was found by Dr. Stuart T. Danforth on booby (*Sula leucogaster*) on Desecheo Island, as recorded by Dr. J. E. Bequaert (1933-105 and 1940-321).

Olfersia spinifera (Leach), originally described as a *Feronia*, was collected by Prof. J. A. Ramos from man-o'war bird (*Fregata magnificens*

rothschildi) at Mayagüez and on Mona Island, the flies being identified by Dr. Alan Stone. According to Dr. Bequaert (1940-320), "this species is found throughout most tropical seas, the normal host being man-o'war birds, although occasionally it strays onto other marine birds."

Lynchia albipennis (Say), originally described as a *Olfersia*, was collected by Dr. Alex Wetmore at Río Piedras, December 22, 1916, the host not recorded. According to Dr. Bequaert (1940-323), it is "common and widely distributed in the New World, from Massachusetts to Brasil and the Galapagos; the usual parasite of many wading birds, accidentally found also on duck and gulls."

Pseudolynchia canariensis (Macquart) was identified from Puerto Rico by Dr. J. M. Aldrich as *Lynchia maura* Bigot, the flies taken from domestic pigeons in 1921. "Originally an Old World fly," according to Dr. Bequaert (1940-324), it "has been spread by man with domestic pigeons to most tropical and warm temperate regions." In Puerto Rico, it has been found on pigeons at Yabucoa, Río Piedras, Coamo, San Germán and Mayagüez.

Streblidae: Batflies

Trichobius dugesii Townsend, described originally from Mexico, was identified by Herr Victor von Roeder as *Strebla vespertilionis* Fallén for Dr. Gundlach, who noted that it "vive sobre los murciélagos, y se le conoce en Cuba y otras Antillas." Mr. D. W. Coquillett lists it from Puerto Rico, as well as from Jamaica and Arizona, and this specimen, collected by Mr. Aug. Busck at Bayamón has been re-examined by Dr. J. E. Bequaert, who confirms the original determination. Dr. J. W. Jobling (Parasitology 30 (3): 383. Baltimore, 1938) records collection in Puerto Rico from *Artibeus jamaicensis*. Dr. H. L. Van Volkenberg (1939-4) records, as identified by Dr. Alan Stone, the collection of this fly from bat by Dr. H. D. Tate at Boquerón.

Trichobius pseudotruncatus Jobling (= *T. kesselae* Jobling), as identified by the describer, was taken from *Artibeus jamaicensis* in Puerto Rico.

Trichobius truncatus Kessel, as identified by Dr. J. W. Jobling, was taken from *Artibeus jamaicensis* in Puerto Rico.

Aspidoptera busckii was described by Mr. D. W. Coquillett as one of "New Genera and Species of Nycteribidae and Hippoboscidae" (Canadian Entomologist, **31** (11): 333–6. London, November 1899), named in honor of the collector who found it on bats (*Artibeus* sp.) at Bayamón.

Pterellipsis aranea was described by Mr. D. W. Coquillett (1899–334) from material collected on bats at Bayamón by Mr. Aug. Busck, and additional specimens from Jamaica and Montserrat. It has since been collected on bats from a cave near Boquerón by Dr. H. D. Tate, as noted by Dr. H. L. Van Volkenberg (1939-4). From a host, *Brachyphylla cavernarum*,

it has been identified by Dr. J. E. Bequaert, as noted by Dr. H. E. Anthony on page 39 of his "Mammals of Porto Rico, Living and Extinct" (Scientific Survey of Porto Rico and the Virgin Islands, **9** (1): 1–238, pl. 54. New York, 1925).

Paradyschira dubia Rudow was identified from Puerto Rico as *P. fusca* Speiser by Dr. J. C. Bequaert, as noted by Dr. Anthony (1925-18), taken from *Noctilio leporinus mastivus* from a cave (Piedra de la Cueva) at Loíza Aldea.

SIPHONAPTERA

Fleas

Pulicidae: Common Fleas

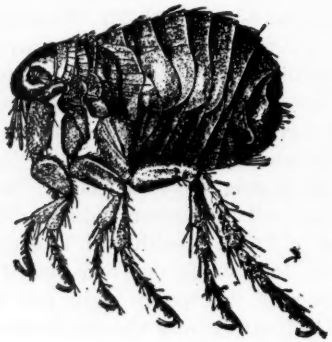
Xenopsylla cheopis (Rothschild), the tropical rat flea, originally described as *Pulex* from Egypt, is by far the most abundant flea in Puerto Rico, not mentioned by Dr. Gundlach, but number 1714 "on rat" in Van Zwaluwenburg's list. In the preliminary, third and final reports on "A Rat-Flea Survey of the City of San Juan, Porto Rico" (P. R. Review (or Journal) of Public Health and Tropical Medicine, **3** (2): 131–145, August 1927; **4** (2): 84–92, San Juan, August 1928; **5** (2): 158–166, San Juan, August 1929, *and* Public Health Reports, **43** (11): 611–616, Washington, D. C., March 16, 1928 and **47** (4): 193–201, Washington, D. C., January 22, 1932) conducted by Drs. O. H. Cox, A. L. Carrion and Carroll Fox, this one flea was found to constitute 99.5 to 98.5 percent of the total flea population of rats. The comparable rat-flea survey of Santurce now being made by Dr. Irving Fox is yielding comparable results as to the abundance of this species and the scarcity of others, to date having added no new records to the known flea population of the Island. Mr. Jenaro Maldonado Capriles has summarized all the known data on "The Fleas of Puerto Rico" (P. R. Journal of Public Health and Tropical Medicine, **21** (2): 173–183 and in Spanish 184–192, fig. 8. San Juan, December 1945), emphasizing the importance of this species in its role as vector of bubonic plague. In continental United States the distribution of this flea is confined to seaport cities and to islands of infestation in the interior, as related by Drs. H. E. Ewing and Irving Fox in discussing "The Fleas of North America" (U. S. D. A. Miscellaneous Publication No. 500, pp. 142, fig. 13, ref. 91. Washington, D. C. February 1943). No information is available as to the rat-flea population of the interior of Puerto Rico, or away from towns in the mountains, as on El Yunque, where rats were extremely abundant when much construction and road building was in progress there.

Ctenocephalides canis (Curtis), given as No. 1708 in Van Zwaluwenburg's list "on dog," was shown in the Cox-Carrion-Fox rat-flea survey to be very scarce on rats. Dr. H. L. Van Volkenberg (1932-26) lists this species as a *Ctenocephalus* as the only one found on mongoose, and (1939-3), without indicating who identified the material, as "very common on dog, also collected from cat and mongoose." "*Ctenocephalides felis* and *C. canis* are almost cosmopolitan," according to Drs. Ewing and Fox (1943-109), "both species having followed man into many parts of the

world. However, in certain regions one species may occur to the exclusion of the other," and Dr. Fox hesitates in asserting that the dog flea is present in Puerto Rico, the typical flea locally present on dogs being *C. felis*.

Ctenocephalides felis (Bouché) is number 1817 in Van Zwaluwenburg's list, "on rat." The Cox-Carrion-Fox rat-flea survey showed it and or the dog flea to be very scarce on rats in Puerto Rico. Dr. M. A. Stewart identified this flea from dog, and from confined calves for Dr. H. L. Von Volkenberg, but he (1939-4) lists it as "common on cat."

Pulex irritans irritans Linnaeus, originally described from material collected on man, in Sweden, is now thought by Drs. Ewing & Fox to have originated in the New World. It was first listed from Puerto Rico by Dr. Stahl, and was identified by Dr. F. C. Bishopp from material collected on



Pulex irritans Linnaeus, greatly enlarged. (After Bishopp, U. S. D. A.)

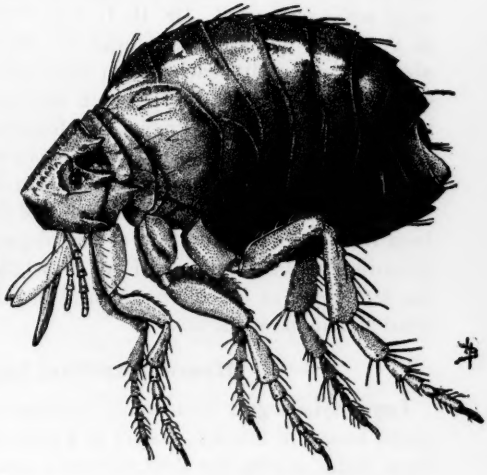
man at Pt. Cangrejos. Out of over a thousand rats examined in the Cox-Carrion-Fox rat-flea survey, only four fleas of this species were collected. It was not listed from Mayagüez by Mr. R. H. Van Zwaluwenburg, but material from man at Mayagüez was identified by Dr. H. E. Ewing for Dr. H. L. Van Valkenberg, who notes it (1939-3) as "infrequent on dog and rat." The quite general replacement of wooden floors by tile or concrete has greatly reduced the abundance of this flea, for the larvae breeding in the dust-filled cracks of wooden floors, or underneath houses with wooden floors, are now automatically eliminated. Mopping wooden floors with emulsion of kerosene or crude carbolic acid ("creso") was only temporarily effective in rendering them free from fleas, and the early movies, especially the one at Borinquen Park in the Condado and the Tapia Theater in San Juan, were never effectively cleaned of these pests. For persons especially susceptible to infestation by fleas, the performance must be especially

attractive to counterbalance the discomfort to be expected from the fleas that invariably would be picked up. Air-conditioning has also reduced the activities of fleas somewhat, and mechanical cleaners, but the major factor has been the elimination of the dust-filled cracks of wooden floors.

Hectopsyllidae (Echidonophagidae): Burrowing or Sticktight Fleas

Echidnophaga gallinacea (Westwood), originally described as a *Sarcopsyllus* from domestic fowl in Ceylon, has probably been carried with the specific host to most of the tropical and subtropical regions of the world, and presumably has long been present in Puerto Rico, altho not

Head of Rooster infested with Sticktight Fleas. (After Bishopp, U. S. D. A.)



The Sticktight Flea, *Echidnophaga gallinacea* (Westwood), greatly enlarged. (After Bishopp, U. S. D. A.)

listed by either Dr. Stahl or Dr. Gundlach. Indeed, the first record is in Van Zwaluwenburg's list, where it is No. 1719 "on rat and fowls;" an infestation on baby chicks being noted by the parasitologist Dr. G. Dikmans, in the P. R. (Mayagüez) Expt. Station report for 1926 (1927-30) more than a decade later. The Cox-Carrion-Fox rat-flea survey showed that 93 individuals of the sticktight flea had been found on over a thousand rats. Later identifications have been made by Dr. F. C. Bishopp and Mr. H. S. Peters. Dr. H. L. Van Volkenburg (1939-3) lists it as "common on chickens; occasionally serious infestations occur on young birds." The standard remedy for killing the fleas on small chickens is the application of

carbolated vaseline to the infested areas. Its efficiency may be increased by the addition of derris or pyrethrum.

Tunga penetrans (Linnaeus) is listed from Puerto Rico by Herr C. Moritz (1836–377) and Dr. Stahl under its original name, *Pulex penetrans* Linnaeus, the type host being man, from "America." The sand flea or "nigua," common enough in Puerto Rico, is nowhere here sufficiently abundant so that, as in the Dominican Republic, this name is applied to a town. Listed by Mr. R. H. Van Zwaluwenburg as a *Sarcopsyllus*, number 1715 "on man," in "Insectae Portoricensis" (1923–237) it is noted as a *Dermatophilus* "common on man, usually after bathing on sandy beaches (Condado and Pt. Cangrejos), occasionally abundant on clay soil under houses. Supposed to cause large scabs on hogs." Dr. H. L. Van Volkenberg (1939-3) lists this flea as "common on pigs raised near the seashore," as it is normally more abundant on sandy beaches than elsewhere. On man, the favorite points of attack by this flea are between the toes and under the finger or toe nails, but instances are known of infestation on the nipple of the breast. The increase in size of the fertilized female causes a peculiar tingling feeling in the host, and is often the first indication of infestation, the minute brownish spot which is the undistended body of the female having not previously been noted. "The dilatation of the abdomen" with the developing eggs, according to Drs. Ewing and Fox (1943-122), "takes place entirely through the stretching of the intersegmental membrane between the second and third abdominal segments."

Hystrichopsyllidae: Leptopsyllinae

Leptopsylla segnis (Schoonherr), originally described as a *Pulex* from the house mouse in Sweden, occurs in Puerto Rico, a single specimen having been found among the fleas collected from over a thousand rats in San Juan, as reported by Dr. A. L. Carrion (1932-195), the identification having been made by Dr. Carroll Fox.

LEPIDOPTERA

RHOPALOCERA: Butterflies

The types of many of the butterflies of the West Indies are presumed to have been collected in the Danish Island of St. Thomas, which, in the eighteenth century was a busy free port, its harbor filled with the shipping of all nations. The Spanish colony of Puerto Rico had long been closed to the commerce of any other nation than Spain, and often long intervals elapsed between the arrival of ships from the mother country. The first record of the occurrence of well-known West Indian butterflies in Puerto Rico is of collection in 1835 by Herr C. Moritz, whose "Notizen zur Fauna der Insel Puertorico" (Wiegmann's Archiv für Naturgeschichte, **2**: 373–392. Berlin, 1836) lists them largely according to the environment in which they were observed, altho "die blassgelb und schwarz geringelte Raupe" of the Monarch is noted feeding on the leaves of "die feuerroth blühende *Asclepias curassavica*". The names given by Herr Moritz were correct for the day and age in which he lived, and their modern equivalent is given here only for convenience.

Papilio Steneles	*Metamorpha* (or *Victorina*) *stelenes* Linnaeus
Hipp. Jatrophae	*Anartia jatrophae* Johansson
Heli. Charitonia	*Heliconius charithonius* Linnaeus
Vanillae	*Dione vanillae* Linnaeus
Julia	*Dryas* (or *Colaenis*) *iulia* Fabricius
Van. lavinia	*Junonia evarete* Cramer
Hesp. hibisci	?
Eupl. Archippus	*Danaus* (or *Anosia*) *plexippus* Linnaeus
P.Dirce	*Colobura* (or *Gynaecia*) *dirce* Linnaeus
P. Hyperia	*Biblis hyperia* Cramer
"Braune langgeschwänzte Hesperien"	*Urbanus* (or *Eudamus*) *proteus* Linnaeus
"citron-gelbe *Colias*"	*Eurema* spp.
"kleine blassgelb und weissliche *Pontiae*"	*Ascia* (or *Pieris*) *monuste* Linnaeus

The butterflies of Puerto Rico, while not nearly so abundant as in some other tropical regions, are such conspicuous and obvious members of the insular fauna that the inclusiveness of the records by Dr. Agustín Stahl and Dr. Juan Gundlach are naturally to be expected. Dr. Hermann Dewitz identified the butterflies collected by Dr. Gundlach, discovering

among them two new species and two subspecies, described in his paper on the "Tagschmetterlinge von Portorico" (Stettiner Ent. Zeitung, **38:** 233-245, pl. 1. Stettin, 1877). All of these records are included by Herr Heinrich Benno Möschler in "Die Lepidopteren-Fauna von Portorico" (Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft, **16:** 69–360, pl. 1, fig. 25. Frankfurt-am-Main, 1890). In more recent years, Dr. Harrison G. Dyar and Dr. Wm. Schaus have identified some additional species, and a few new ones have been described from Puerto Rico. Mr. William Phillips Comstock has prepared such an excellent and wholly satisfactory account of "The Butterflies of Porto Rico" (Scientific Survey of Porto Rico and the Virgin Islands, **12** (4): 421–622, fig. 29, pl. 12, ref. 319. New York, October 12, 1941) that the present account can be considered little more than a summary.

Danaidae

Danaus plexippus (Linnaeus), originally described from "America septentrionali" as a *Papilio*, is the common cosmopolitan milkweed or "Monarch" butterfly, of which three subspecies occur in Puerto Rico. It was listed by Drs. Stahl and Dewitz as *Danais archippus* Fabr., and as *Danaus erippus* Cramer by Herr Möschler and by Dr. Gundlach, the latter noting "la oruga se cría en la *Asclepias curassavica.*" As an *Anosia* it is listed by Mr. R. H. Van Zwaluwenburg (2002), and by Dr. Stuart T. Danforth (1926–23) noted as one of the less common species in "the clouds of butterflies which arise as one walks through the fields as one approaches (Cartagena) Lagoon." Ordinarily it is not especially abundant, but Mr. Francisco Seín describes "Una Invasión de Mariposas" (Rev. Agr. P. R., **22** (10): 169–70. San Juan, 1929) in the metropolitan area, flying against the northeast trade winds, about a month after the hurricane of San Felipe (September 13, 1928). Presumably the connection between this migration of butterflies and the hurricane is quite fortuitous, merely serving to date it. The path of migration is at right angles to that of the hurricane, and the area in which the butterflies originated, the southwestern corner of the Island, Mona Island and southeastern Santo Domingo, was practically unaffected by the hurricane.

Danaus plexippus plexippus (Linnaeus) is listed by Prof. J. A. Ramos (1947–52) from Mona Island, and it doubtless finds greater opportunity to develop in large numbers there than in intensively cultivated Puerto Rico. Indeed, Mr. Austin H. Clark in his "Notes on some North and Middle American Danaid Butterflies" (Proc. U. S. National Museum, **90** (3118): 531–542, pl. 4. Washington, D. C., 1941) excludes Puerto Rico from the range of this most widely distributed and cosmopolitan subspecies, but Mr. Wm. P. Comstock (1944–431) states that "it definitely occurs in its typical

form in Puerto Rico." It has "two spots beyond end of cell on forewing and two larger spots between these and apex, light dull orange, contrasting with small white spots on costal border," as shown by a specimen in the Río Piedras collection from Guánica Lagoon. The naked caterpillar, narrowly striped with black, yellow and greenish white, apparently has no muscular control over the paired fleshy black filaments on its prothorax and on the tenth segment, which are neither retractile nor extendible, and exude no odor. The copious exudation of milky juice from the leaves of host, even from the giant milkweed (*Calotropis procera*) of xerophytic regions, seems to bother these caterpillars not at all, altho they often pupate elsewhere than on the host plant. Indeed, it is possible that the larvae of this subspecies develop on the leaves of the giant milkweed, those of the others being restricted to the more slender and less milky *Asclepias curassavica*.

Danaus plexippus megalippe (Hübner), the neotropical subspecies, occurs in Santo Domingo and many of the Lesser Antilles, according to Mr. Austin H. Clark (1941–536), the record for Puerto Rico being a specimen collected by Mr. August Busck at Mayagüez in January 1899, which "lacks the two white spots beyond the end of the cell in the forewing" supposedly typical of this subspecies. In the Río Piedras collection is a specimen reared by Mr. Thos. H. Jones from *Asclepias curassavica* which posesses such white spots.

Danaus plexippus portoricensis was described by Mr. Austin H. Clark (1941–539) as being "smaller; the forewing less than 45 mm. long; pair of white spots just beyond the end of the cell in the forewing absent," known only from Puerto Rico, the type having been intercepted by Messrs. A. S. Mills and C. G. Anderson at Ciales, December 5, 1933. This is Interception Number 4888, which was identified by Dr. Wm. Schaus as a local race of *Danais cleophila* Godart, and was thus recorded in "Insectae Borinquenses" (1936–397). This is the typical monarch butterfly of the mountains and the more humid regions of Puerto Rico, Mr. Wm. P. Comstock (1944–433) listing it from over a dozen such localities. The Río Piedras collection has one specimen from Mona Island, found dead in a spider web.

Danaus gilippus cleothera (Latreille), originally described from Hispaniola, has been collected at Lajas by Prof. J. A. Ramos. "The pattern of the upperside is like that of *plexippus*, but the smaller size of the butterfly immediately distinguishes it," according to Mr. Wm. P. Comstock (1944–435).

Lycorea ceres cleobaea (Latreille), listed from Puerto Rico as *Lycorea cleobaea* Godart by Drs. Dewitz, Stahl and Gundlach, is noted by Herr Möschler (1980–94) as "sehr selten, nur auf einigen Gebirge vorkommen." Mr. Wm. P. Comstock (1944–437) records collections at Adjuntas and

Aibonito; the Río Piedras collection contains one adult from Caguas, taken by Mr. Cesario Pérez in August 1941. This is a fine, large black butterfly, its wings spotted and banded with bright yellow and dull orange, as described in detail by Mr. Comstock, of which the larvae may be expected to be found feeding on the leaves of *Ficus*.

Nymphalidae

Heliconius charithonius charithonius (Linnaeus), originally described as a *Papilio* from America, is one of the most characteristic butterflies of clearings in the woods of the neotropics, the zebra butterfly. Even now, when so much of Puerto Rico is open canefield, one still finds the zebras in the coffee groves and along roads or streams in the virgin forest reserves, as well as at Peñón del Collao between Cayey and Salinas, in Guajataca gorge, and on the Isle of the Caves and the Seboruco woods bordering Laguna San José. Even a minor hurricane like San Ciprián, however, can bring these shy forest denizens to the Plaza of Río Piedras. Dr. Gundlach says of the zebra "es notable por la costumbre que tienen todas las de una localidad de reunirse por la tarde y dormir una al lado de otra. La oruga se cría en especies del género *Passiflora*." Mr. Wm. P. Comstock summarizes the life-history detailed by William Henry Edwards (1884), and the extraordinary appearance of larva and pupa. He has "no doubt that the type specimen of *charithonius* came from one of the Virgin Islands," but we have no record from Culebra and Vieques, altho zebras are common in the shade of the cliffs on Mona Island.

Heliconius charithonius punctatus Hall, a subspecies which is the "constant form in St. Kitts," differs in "having an additional yellow streak in vein Cu_1 of the forewing" and is represented by about a quarter of the specimens from Puerto Rico, according to Mr. Wm. P. Comstock (1944–439).

Eueides cleobaea cleobaea Geyer has not been found in Puerto Rico since listed by Dr. Gundlach as *Eueides cleobaea* Hübner: "La oruga se cría en especies del género *Passiflora*" and by Herr Möschler (1880–95) "selten, Raupe auf Asclepiadisarten."

Dryas iulia juncta was described by Mr. Wm. P. Comstock (1944–441) as a distinct Puerto Rican subspecies of what was first listed from Puerto Rico as *Colaenis delila* Fabricius by Drs. Dewitz, Stahl and Gundlach, the latter noting "la oruga se cría en las *Passifloras*," and called *Colaenis julia* Fabricius in Van Zwaluwenburg's list (P. R. 1419) after specimens collected for the American Museum of Natural History at Aibonito and Mayagüez. Dr. Wm. Schaus identified as *Colaenis cillene* Cramer one of these butterflies intercepted at Cidra but Mr. Comstock refers them all to his local subspecies. Of their "ground color; the upperside is dull fulvous in the males and grayish fulvous in the females": a hardly noticeable dif-

ference unless the two are found together. Altho these large dull-colored butterflies have been found in the metropolitan area they normally frequent more elevated localities, as Indiera and El Yunque, or such comparatively unfrequented regions as Guajataca gorge and the more retired coffee groves.

Dione vanillae insularis (Maynard), originally described as an *Agraulis* from the Bahamas, Cuba and Jamaica, was recorded from Puerto Rico as *Agraulis vanillae* Linnaeus by Drs. Stahl, Dewitz and Gundlach, and by Herr Möschler, both of the latter noting that its larvae feed on *Passiflora*. Considering how comparatively scarce passion vines are anywhere in the tropics it seems most surprising that the caterpilars of so many kinds of tropical butterflies should feed on its leaves. Most of these are comparatively rare, but not *Dione*, which is possibly one of the most abundant butterflies at least in Puerto Rico, and is equally at home in forest reserves and in the metropolitan area; on the beaches, in citrus groves and taking nectar from flowers at the margins of cane fields. It is common on Mona Island, and presumably occurs also on Desecheo, Vieques and Culebra Islands, as in all the Lesser Antilles and westward in the Greater Antilles. One can not fail to recognize it, with bright silvery spots on the underside of both fore and hind wings; the upper surfaces, brownish-orange with black spots, being decidedly less attractive. Prof. J. A. Ramos (1947–52) not only collected adults on Mona, but also larvae on *Corchorus hirsutus*, which were reared to adults. Presumably they had consumed all of the passion vines on which the eggs were laid, and were forced to complete their growth feeding on whatever second choice was available.

Euptoieta hegesia (Cramer), of which Mr. Wm. P. Comstock (1944–444) describes the Puerto Rican subspecies as **watsoni,** was listed by Drs. Dewitz, Stahl and Gundlach, the latter noting "la oruga se cría en la planta *Turnera ulmifolia*." Mr. F. E. Watson, for whom the local subspecies was named, reared larvae from this host near San Juan in the summer of 1914, and collections have been made at Pt. Cangrejos. "The larva is blood-red with short black spines, and forms a pupa about 20 mm. long which has two rows of dorsal tubercles." Mr. E. G. Smyth collected this butterfly at Camuy, Prof. J. A. Ramos at Mayagüez and Lajas, and Dr. Stuart T. Danforth (1926–23) notes it as one of members of the clouds of butterflies in the fields around Cartagena Lagoon.

Phyciodes pelops pelops (Drury), a little brownish butterfly barred with dull orange, was listed from Puerto Rico as a *Melitaea* by Drs. Dewitz, Stahl and Gundlach and by Herr Möschler; Dr. Harrison G. Dyar identified as *Phyciodes anocaona* H. S. the specimen collected by Mr. Thos H. Jones on El Duque, and Dr. Wm. Schaus as *Phyciodes aegon* F. one inter-

cepted in the metropolitan area. It occurs in all parts of Puerto Rico, Mr. F. E. Watson having found it at Manatí, Arecibo, Quebradillas, Mayagüez and Aibonito, and Dr. Luis F. Martorell at Caguas and Cayey.

Phyciodes frisia frisia (Poey) is listed from Puerto Rico by Mr. Arthur Hall in "A Revision of the Genus *Phyciodes* Hubn." (Suppl. Bull. Hill Museum, p. 83, Witley, Surrey, 1929).

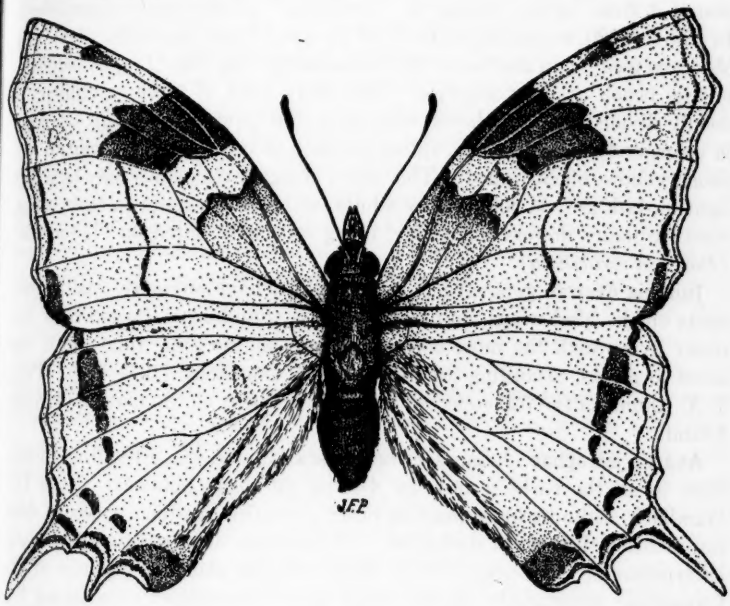
Chlosyne perezi tulita was described by Dr. Herman Dewitz (1877–238) from specimens collected in Puerto Rico by Dr. Gundlach, and using Dr. Gundlach's MS name of *Synchloe tulita*. Dr. Gundlach himself, Dr. Stahl and Herr Möschler all use the generic name of *Coatlantona*, the latter noting (1880–96) "Haufig in dem Gebirgen von Quebredelle von Oktober bis Januar," echoing Dr. Gundlach's observation that it occurs near the coast, possibly because of the host plant of the larva, which Dr. Gundlach did not discover. Mr. F. E. Watson found it at Tallaboa, but Quebradillas is definitely the place where it is most abundant, Dr. Luis F. Martorell having made recent collections in Guajataca gorge. The butterflies are of medium size; "the ground color of the upperside is brownish black with deep orange markings."

Vanessa virginiensis (Drury), the common everlasting butterfly of continental America, is resident in Puerto Rico, one adult having been intercepted at Cayey by Messrs. Richard Faxon, A. S. Mills and C. G. Anderson, as identified by Dr. Wm. Schaus, another at Orocovis collected by Mr. F. E. Watson, and one at Indiera by Prof. J. A. Ramos. Typical nests of the spiny caterpillar on everlasting have been noted in the hills south of Fajardo, but nothing was left to identify the insect but the empty chrysalis skin.

Vanessa cardui (Linnaeus), the common nettle butterfly or "Painted Lady" of continental North America, is a rare visitor to Puerto Rico, listed as a *Pyrameis* by Drs. Dewitz, Stahl and Gundlach, and by Herr Möschler, and since noted but once at Cayey. The anticipated occurrence of the Red Admiral butterfly, *Vanessa atalanta* (Linnaeus), the spiny caterpillars of which also feed on nettle, predicted by Mr. Wm. P. Comstock (1944–451) as "possible" in Puerto Rico because of its presence in Hispaniola, is actually most unlikely, for the mountains of Hispaniola are much higher and have an introduced continental and European flora quite different from the tropical hurricane forests of Puerto Rico.

Hypanartia paullus (Fabricius), originally described as a *Papilio* from Jamaica, was listed from Puerto Rico by Dr. Dewitz as *Euroma tecmesia* Hübner, but Dr. Gundlach and Herr Möschler use the presently accepted name. The adult is a medium-sized yellowish-brown butterfly with darker brown markings, a conspicuous white spot on the forewings, the hindwing tailed at M_3 and Cu_2. The spiny caterpillars hide during the

day in folded-over leaves of "guacimilla" (*Trema micrantha*), as described in detail in "Insectae Portoricensis" (1923–140). The chrysalis is formed in a similar, but uneaten leaf. The caterpillars are really quite common, several often being present on a single small tree, which is typical of cut-over second-growth forest at the higher elevations, or in cuts along new roads in the mountains.



Adult of the Guacimilla Caterpillar, *Hypanartia paullus* (Fabricius), twice natural size. (Drawn by José F. Pietri.)

Junonia evarete (Cramer), the Buckeye butterfly, of which three subspecies occur in Puerto Rico, was first listed as *Junonia lavinia* Cramer by Drs. Dewitz, Stahl and Gundlach, the latter noting "esta especie varía mucho; pero no es igual a la *J. coenia*," and Dr. Stahl also uses the name *Junonia genoveva* Cramer for one of these varieties.

Junonia evarete coenia (Hübner) is presumed to occur in Puerto Rico based on the record of identification of specimens from Mayagüez in the list by Mr. R. H. Van Zwaluwenburg (P. R. 138); material collected by Mr. Thos. H. Jones at Río Piedras in 1912; and an interception in the metropolitan area of San Juan, but the identity of these specimens can not now be determined.

Junonia evarete zonalis (C. and R. Felder) is the common subspecies of the Buckeye in Puerto Rico, to which may be referred the earlier records under the name of *Junonia genoveva* Cramer. It occurs in abundance in all parts of the Island, Dr. Stuart T. Danforth noting it as one of the common butterflies in the fields around Cartagena Lagoon, and Prof. J. A. Ramos lists it from Mona Island. In the summer of 1916, Mr. E. G. Smyth reared it from larvae feeding on "bretónica" (*Valerianodes jamaicense*). In March 1920, enormous numbers of its spiny black caterpillars had been observed feeding on another of the Verbenaceas: fog-fruit (*Lippia nodiflora*) on the beach at Pt. Cangrejos. The shiny head of these caterpillars is deeply divided into two lobes, each with short spine; neck light chestnut in color, body velvety black, spines purplish at base, the more ventral row short, yellow, black-tipped. The spiny, elongate chrysalids may be either light or dark grey in color. The adults, with big eye-spots on their wings, come to many flowers for nectar, being especially noted on "botoncillo" (*Borreria verticillata*).

Junonia evarete genoveva (Cramer) adults have obviously smaller eye-spots on the hind wings, and are much less abundant in Puerto Rico, but occur flying with the more common *zonalis* at the same time and in the same localities, according to Mr. Wm. P. Comstock (1944–456). Prof. J. A. Ramos (1947–52) collected several specimens on the plateau of Mona Island.

Anartia jatrophae (Johansson) **semifusca** Munroe was listed from Puerto Rico in all the early records as *Anartia jatrophae* Linnaeus. Even Dr. Gundlach, altho listing numerous other countries in which it occurs, does not mention the host of the larvae. At the same time that the spiny black caterpillars of the Buckeye were defoliating the plants of fog-fruit at Pt. Cangrejos, superficially similar black spiny caterpillars were eating the leaves of water hysop, *Bacopa monniera*, and mingling with them in seeking a suitable place for pupation. Their shiny black heads had two branched spines; the body with silvery spots more abundant dorsally, warts on first segment, large branching spines on others. The chrysalids were more obviously different; short and plump, light green in color, or opaque purplish-black, with bloom, and from them emerged the characteristic greyish-brown butterflies, barred with dull orange and white, with a conspicuous eye-spot on the forewings and two smaller ones on the hindwings. They occur in all coastal areas of Puerto Rico but were not noted on Mona Island. Dr. Stuart T. Danforth (1926–23) estimated that they constituted nine percent of the clouds of butterflies which arise as one walks thru the fields approaching Cartagena Lagoon. One may doubt, however, if he had not confused their caterpillars with the very similar ones of the Buckeye, feeding on

Lippia reptans, which on September 23, 1924 "were so excessively abundant as to nearly conceal the plants."

Metamorpha stelenes stelenes (Linnaeus), described originally as a *Papilio* from Jamaica, is one of the largest of Puerto Rican butterflies, dark brown with numerous and extensive greenish white spots above, mostly silvery white and light orange beneath, often to be seen along the margins of coffee groves in the mountains, but also present in citrus and coconut groves along the coast. As a *Victorina* it was listed by the earlier workers, Herr Möschler (1880–98) noting "raupe auf *Blechnum* (Gdl.) und *Plantago* (Poey)" and Dr. Wm. Schaus identifying one intercepted at Adjuntas as *V. lavinia* F. *Blechum brownei* is an inconspicuous, low-growing plant of forest margins, locally called "yerba de papagayo," while *Ruellia coccinea*, on which Mr. F. E. Watson found the caterpillars feeding, is "yerba maravilla," both Acantaceas. The fully-grown caterpillar is about 40 mm. long, 7 mm. wide; head glistening black, roughened with long black hairs, and two long black, knobbed and spined horns, 6 mm. long: body velvety black, purplish or dark red at sutures, with four blackened spiny warts on first segment; four branched spines, orange-red or pink, on second and third segments; seven spines on each of the next seven segments, the more ventral ones shorter and all black, the next sometimes pink at base, the three dorsal rows always pink at base and arising from round orange spots, which are coalescent on the first three abdominal segments, but black-tipped, sometimes one-half or two-thirds black; eight spines on the eleventh segment and four arranged in a square on the final segment; true legs black and shiny, prolegs pinkish. The chrysalis is 28 mm. x 10 mm., light green in color, covered with whitish bloom, head and wings transparent; suspended from a pinkish cushion of silk by black cremaster 3.5 mm. long, black, divided at base. Two cephalic horns and one dorsal green horn, with slenderer black interior horns. Five pairs of pink spines on abdomen opposite the end of the wing-pads, besides twelve brighter pink spots anteriorly, and numerous smaller pink and black spots posteriorly. The pupal stage last nine or ten days; the larval stage about twenty days.

Biblis hyperia hyperia (Cramer), originally described by Fabricius as *Papilio biblis* from "America," and in 1779 by Cramer from St. Thomas as a *hypera*, is listed by Dr. Stahl as *Didonis hyperia* and *Biblis thadana*, and by Herr Möschler and Dr. Gundlach as *Didonis biblis* Fabricius: the name on the label of specimens collected by Mr. F. E. Watson at Tallaboa, and generally used since. This is a medium-sized dark brown butterfly, the forewings with a diffused and faded-out marginal band, the hindwings with a comparable band of bright red. Dr. Stuart T. Danforth (1926–23) lists it as one of the more common butterflies around the margin of the Carta-

gena Lagoon, and indeed, it may at times occur in swarms towards Faro de Cabo Rojo, but less abundantly to the east along the south coast, or to the north, individuals having been collected at Arecibo, Manatí and Mameyes. Its presence presumably depends on the readiness with which the nettling "pringamoza" (*Tragia volubilis*) grows, this vine having been discovered by Mr. Cesario Pérez when he was at Quebradillas to be the specific host plant.

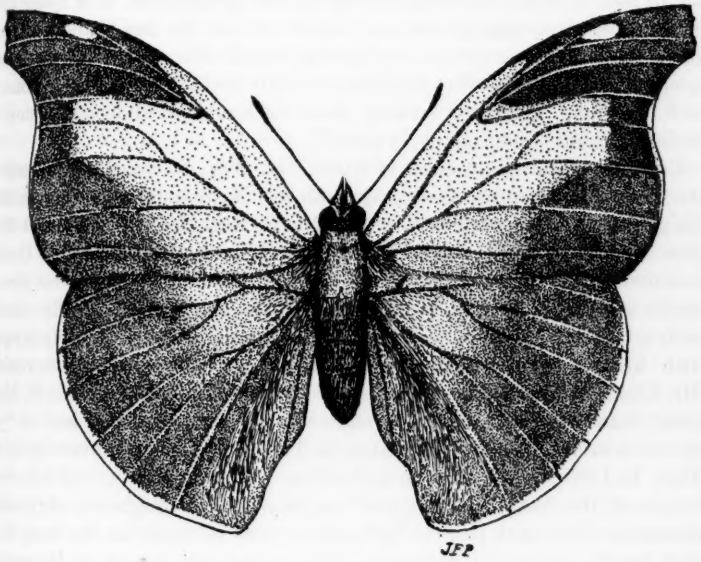
Marpesia petreus thetys (Fabricius) is the name adopted by Mr. Wm. P. Comstock (1944–461) for this rare Puerto Rican butterfly, for which he thinks "it seems proper to resurrect the name *thetys* (Fabricius) for that phase of *petreus* (Cramer of Surinam) which appears north of Panama and extends into Mexico." The latter is the name used by Dr. Stahl and Dr. Dewitz, but Dr. Gundlach adopts the Möschler name of *Megalura peleus* Sulzer. Mr. E. G. Smyth caught a pair of these butterflies at Guánica in July 1915, one dull and pale yellowish brown, the other larger and orange-brown, with three diagonal darker bands extending across both wings, and long, conspicuous tails on the hindwings. The caterpillar feeds on the leaves of fig.

Marpesia chiron (Fabricius) has not been found in Puerto Rico since the records by Drs. Dewitz and Stahl as a *Timetes*, and by Herr Möschler and Dr. Gundlach as a *Megalura*. Dr. Gundlach states that "la oruga se cría en la *Maclura tinctoria* y acaso en el *Xanthoxylon*. El insecto suele posarse encima del fango para chupar." The dyewood "mora" (*Maclura tinctoria*) has been completely eliminated from Puerto Rico for many years, and the caterpillars which preferred its leaves on which to feed presumably perished with it, rather than accept those of "aceitillo" (*Zanthoxylum flavum*), which also is none too abundant despite extensive planting by the Forest Service in recent years.

Hypolimnas misippus (Linnaeus) is one of the most interesting butterflies of Puerto Rico. The female is dark blackish-brown, with a smaller and a larger oval white spot on the forewing and a large white spot on the hindwing. The male is of approximately the same size but mostly brownish-orange, the distal part of the forewing dark with white spots; its general appearance being quite different from that of the female. Dr. Stahl listed it under its presently accepted name, but Dr. Dewitz called it *Diadema bolina* Linnaeus, and Herr Möschler and Dr. Gundlach used this generic name. It has been seen on Mona Island, and presumably occurs in all parts of Puerto Rico, the record being: males at Cayey and along the coast from Palo Seco to Dorado, females at Boquerón, and both sexes in abundance noted by Dr. Luis F. Martorell at Colonia Jauca, Salinas in October 1939. The immature stages have not been noted in Puerto Rico. Mr. Wm. P. Comstock (1944–464) states that "the food plants are said to

be species of Malvaceae, *Ipomoea* and *Portulaca*. The larvae are gregarious. The body of the larva is black with grey bands and rows of whitish, branched spines. The head is reddish with two branched spines. The pupa is light brown with dorsal and lateral tubercles." Dr. Gundlach notes it as "una especie rarísima."

Historis acheronta cadmus (Cramer) has not recently been collected in Puerto Rico, Dr. Gundlach noting that "en el tiempo que hay mangos maduros, acude a ellos para chupar," giving a complicated synonymy under the



Adult of *Historis odius odius* (Fabricius), natural size. (Drawn by José F. Pietri.)

generic name of *Aganisthos*. Ripe mangoes are as popular in Puerto Rico now as in the time of Dr. Gundlach, but they signally fail to attract this butterfly when any entomologist is watching.

Historis odius odius (Fabricius), listed from Puerto Rico as a *Aganisthos* by Drs. Stahl and Gundlach, and as *Aganisthos orion* Fabricius by Dr. Dewitz, is a magnificent big butterfly of the hills and lower mountains, the undersurface of whose wings more or less resembles a brownish leaf. Above, the basal and median portion of the forewing is yellowish-brown, the broad margins velvety black, with a white spot near the apex; the hindwing and body dark brown. Mr. Cesario Pérez collected this butterfly at San Sebastián in December 1942, apparently by chasing after it, but it is

so fond of the juice exuding from coffee shade trees (*Inga vera*) dying of "mal de goma" that it can be captured without a net, as at Ciales in November 1936. Indeed, coffee groves with such dying shade trees seem alive with these powerful big butterflies, but one rarely sees them where such an attractant is absent. Dr. Gundlach was apparently the first to note that the caterpillar feeds on the leaves of the trumpet tree or "yagrumo hembra" (*Cecropia peltata*), and Mr. E. G. Smyth thus describes those he found at Río Piedras towards La Muda: "flattish, medium gray, with white saddle 5 x 10 mm. at middle of back; two prominent projections, with spiny protuberances, projecting upward and outward from the head, about 3 mm. long. In the fully-grown caterpillar the saddle was grayer and less conspicuous. The reddish-brown pupa had two double-curved projections, 4 to 5 mm. long, extending forward from the head and almost touching at their apex, but 2 mm. apart at base."

Colobura dirce (Linnaeus), of which Mr. Wm. P. Comstock described the Puerto Rican subspecies as **wolcotti** in "Nymphalidae of the Antilles (Lepidoptera; Rhopalocera)" (Jour. N. Y. Ent. Soc., **50** (3): 283–288. New York, 1942), was listed by earlier workers as a *Gynaecia*, Dr. Gundlach noting "la oruga vive debajo de la hoja de *Cecropia*, comiendo las nervaciones gruesas." It is a medium-sized, brownish-black butterfly above, with a broad diagonal yellow band across the forewing, intricately striped with white below, apparently most abundant in the Mayagüez region. Mr. Cesario Pérez captured adults at San Sebastián, and Dr. Luis F. Martorell found sixteen black caterpillars on the underside of a leaf of "yagrumo hembra" on the Mt. Britton trail of El Yunque in November 1944. They had bright yellow branched spines on all segments, and two long horns on the head, and pupated to grey-brown, roughened chrysalids, darker dorsally, with pairs of light grey curved tubercles on the first, third and fourth abdominal segments. This subspecies occurs in Hispaniola (and others in Jamaica and Cuba) and possibly on Mona Island, altho not collected there.

Eunica monima (Cramer), originally described as a *Papilio* from "Côte de Guinée," is a small brownish butterfly with five white spots on the forewing, listed from Puerto Rico by all the earlier writers. Swarms of these butterflies, mingled with the following species, were noted by Mr. E. G. Smyth in mid-July, 1915, along the irrigation ditch and sunken road to Tablon No. 13, Hda. Santa Rita, Guánica, but none has been seen there since. Despite their intentness on freshly-crushed stalks of sugar-cane they proved too wary to be caught in his hands on the 13th, but when he returned with a net (and accompanied by the writer) on the 17th they were much less abundant. In March 1940, Dr. Luis F. Martorell collected one specimen on Mona Island.

Eunica tatila Herrich-Schäffer, of which Mr. William James Kaye (1926–473) described the insular subspecies **tatilista** from Jamaica, present also in Cuba, Florida, Hispaniola and Puerto Rico, was listed by all the earlier writers, Dr. Gundlach noting the extent of its variations, "por encima varía por el mayor o menor lustre azul." In all Puerto Rican specimens seen this sheen of the forewings (and to a lesser extent, that of the hindwings) is lavender or purple, definitely not blue, and otherwise they show comparatively little variation, all having six white spots arranged in a pentagon (with one in the middle) on the forewing. In addition to the five adults collected by Mr. E. G. Smyth at the edge of Tablón No. 13 Hda. Santa Rita, the Río Piedras collection contains one other, taken by Don Julio García-Díaz in March 1940 at Río Chavón.

Hamadryas ferox diasia (Fruhstorfer) was not collected in Puerto Rico by Dr. Gundlach, but as *Ageronia ferentina* Godart, he and Herr Möschler relate collection by Dr. Stahl (presumably in the Bayamón region), who sent his specimen to Herr Krug, and "también fué cogido por un colector botánico, el Sr. Sentenis, en el interior de la parte oriental." The AMC collection has one unlabeled specimen, and the Río Piedras collection two, in addition to two specimens collected by Mr. Francisco Seín on trunks of *Inga vera* in coffee grove at Aibonito, January 29, 1924. This is a medium-sized grey butterfly, intricately marked above with darker wavy lines and white spots; beneath for the most part white where it is grey above. It is very common in Hispaniola, where one often finds dozens resting with outspread wings on the trunk of a preferred mango tree, not taking flight until the last minute after discovery. Their wings, tightly appressed to the bark of the tree, often match it so closely in color and mottling as to be almost indistinguishable. Mr. Wm. P. Comstock (1944–472) records collections of adults from Juana Díaz, Guánica, Cartagena Lagoon and Desengaño, and of Fruhstorfer's types from Puerto Rico as well as from Hispaniola. Prof. J. A. Ramos (1947–53) reports collection of these butterflies on Sardinera Beach, Mona Island.

Adelpha gelania arecosa (Hewitson), originally described as a *Heterochroa* from Mexico and the West Indies, and thus listed from Puerto Rico by the earlier writers, was a New Year's capture (1944) by Prof. J. A. Ramos at Indiera. It is not exclusively of the high mountains, however, for Mr. Wm. P. Comstock (1944–473) lists collection at San Juan and Ensenada, as well as at Maricao. It is a small, almost black butterfly, with an oblique chalky white band crossing both wings.

Asterocampa argus idyja (Geyer), listed from Puerto Rico by Drs. Stahl and Gundlach as *Doxocopa* or *Apatura*, is noted by the latter as occurring in Cuba and widely in the United States, the larva feeding on *Ardisia cubana*. It is a yellowish-brown butterfly, even fresh specimens having a

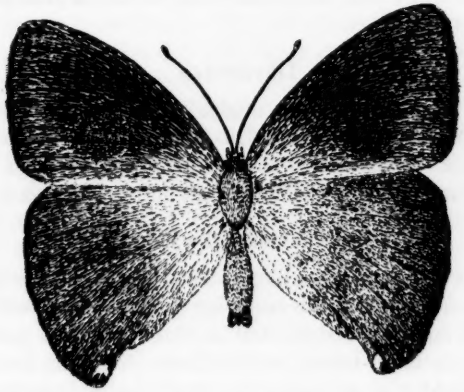
faded-out appearance, of which Mr. Wm. P. Comstock (1944–474) lists collection only at Coamo Springs in Puerto Rico. Dr. Luis F. Martorell collected one of these butterflies at Guajataca gorge, and the Río Piedras collection has another unlabeled specimen.

Prepona antimache insulicola Fruhstorfer is a magnificent big black butterfly with short, iridescent metallic blue-green fascia on both wings; beneath marked with lighter and darker grey. It is found only in the higher hills and mountains. Mr. F. E. Watson collected a female at Ciales, Prof. J. A. Ramos a male at Indiera, but the butterfly is not rare; merely difficult to catch. After heavy rains, one may expect to see one or more of these powerful butterflies at the waterfall of the Río Collazo on the road between Lares and San Sebastián, and Mr. Cesario Pérez captured three of them there. All the earlier writers list this butterfly, and possibly it may have been more abundant when Puerto Rico had more of virgin forest.

Siderone nemesis (Illiger), originally described as *Papilio nobilis nemesis* from "Insel St. Domingo" (Hispaniola), and found also in Cuba, and from Mexico to Brasil, was listed by the earlier workers as *Siderone ide* Hübner from Puerto Rico, altho Dr. Gundlach states that he prefers the older name of *nemesis*. Such a specific name seems hardly significant for such a fine butterfly, with pointed forewings and tailed hindwings that when folded more or less resemble a purplish-brown leaf beneath. Above it has a bloody red triangle at base of forewing and distally an almost equally broad diagonal fascia on a black-brown background that, in certain angles of bright sunlight, shows a purplish sheen. Mr. Wm. P. Comstock (1944-476) reports the food plant of the larva in Mexico as *Casearia abovata*, describes caterpillar and chrysalis, and notes collection in Puerto Rico by Mr. F. E. Watson at Manatí of the adult, and by Prof. J. A. Ramos at Indiera, where it was quite abundant, and by Miss Ann Wolcott at Isabela. Mr. Cesario Pérez collected an adult which shows no sheen at Río Cañas, near Caguas.

Anaea troglodyta (Fabricius) was listed as a *Paphia* from Puerto Rico by the earlier writers, the local subspecies, **borinquenalis,** having been described by Messrs. Frank Johnson and Wm. P. Comstock in their paper on "*Anaea* of the Antilles and their continental Relationships, with descriptions of new Species, Subspecies and Forms" (Jour. N. Y. Ent. Soc., **49** (4); 301–343, pl. 5. New York, 1941). In Van Zwaluwenburg's list two names are given: *Anaea* (*Pyrrhanaea*) *morrisoni* Edwards (P. R. 1413) and *Anaea portia* Fabricius (P. R. 1413), both referring to the same species and subspecies, which varies considerably in the extent of the brownish markings on the orange-red background on the upper side of the wings, the depth of the rose-red sheen, and beneath, the dead-leaf resemblance of the grey or brownish mottling. The caterpillar of the Goatweed butterfly

feeds on *Croton humilis*, and adults are most often noted in xerophytic areas of limestone hills where "yerba bellaca" is the most common vegetation: from Quebradillas, Isabela and Coloso around the west coast of the Island to Guánica, Guayanilla and Ponce. The butterflies themselves may not remain in such barren hills but will be found at irrigation ditches, mud-puddles in country roads, or feeding on the juice of ripe and rotting mangoes or papayas on the ground, almost invisible as long as they keep their wings folded together, but very conspicuous if their upper surfaces are displayed in bright sunlight.



Adult of the Hispaniolan Cane Butterfly, *Calisto pulchella* Lathy, twice natural size. (Drawn by Fritz Maximilien.)

Satyridae: the Satyrs

Calisto nubila was described from Puerto Rico by Mr. Percy I. Lathy in "A Monograph of the Genus *Calisto* Hübner," (Trans. Ent. Soc. London, pt. 2, pp. 221–228, pl. 1, fig. 1–13. London, 1899), the earlier records under the name *Calisto zangis* F., even as late as in Van Zwaluwenburg's list (P. R. 1419), all referring to this one little inconspicuous mountain Satyr, almost wholly black-brown above, lighter beneath with a dark eye-spot in the forewing. It occurs in the hills back from the coast, but most abundantly in the high mountains; at Indiera and on El Yunque, the caterpillar presumably feeding on coarse grasses. Its habitat is quite different from the Hispaniolan cane butterfly, *Calisto pulchella* Lathy, which may swarm at times in the callejones of cane fields close to sea-level, the caterpillars often during the winter becoming injuriously abundant feeding on the older leaves of sugar-cane, as well as on the tender young leaves of the central whorl. In all the years during which enormous quantities of cane

were annually imported into the port of Guánica from La Romana, R. D., no stage of these butterflies arrived in Puerto Rico alive, due to the unceasing vigilance of the local Plant Quarantine Service, which supervised and inspected the fumigation of the cane boats and their cargoes. Other insects, both harmful, neutral and beneficial, are known to have become established in Puerto Rico due to importations from Hispaniola, but not the Hispaniolan cane butterfly against which the quarantine restrictions were formulated.

Megisto cymela (Cramer), as identified by Mr. Wm. P. Comstock (1944–480), was collected by Miss Ann Wolcott at Isabela in June 1938: the only record for Puerto Rico.

Libytheidae

Libytheana terena (Latreille) originally described from the Antilles (according to Mr. Wm. J. Kaye (1926–476) from Puerto Rico), was listed by Drs. Dewitz, Stahl and Gundlach as *Libythea motya* Boisduval & Leconte, but has not been collected locally in recent years.

Lycaenidae: the Blues

Thecla fidena Hewitson, according to Mr. Wm. P. Comstock (1944–485), "is the largest of the Theclinae occurring in Porto Rico, with a length of forewing of 16 mm. The single tail at Cu_2 is about 4 mm. long. The upperside color is black-brown, with a sheen extending from the base of both wings, bright blue in males, and dull blue in females." Listed by Drs. Dewitz and Gundlach, Herr Möschler (1880–101) notes "raupe auf *Tetrapteris*." It was most recently collected by Mr. F. E. Watson at Isabela in 1915.

Thecla acis mars (Fabricius) is characterized by the diagonal white bars, margined with black, on the underside of the wings. It was listed as *Thecla acis* Drury by Drs. Dewitz and Gundlach, and by Herr Möschler, without comment. All recent specimens are from the south coast: Ensenada, Ponce and Coamo, and if this restriction to a xerophytic habitat holds, one can understand why Dr. Stahl made no collection in the Bayamón region.

Thecla angelia Hewitson, of which Messrs. Wm. P. Comstock and E. Irving Huntington in their "Lycaenidae of the Antilles" (Annals N. Y. Academy of Siences, **45** (2): 49-130, pl. 1, ref. 90. New York, December 29, 1943) described the local subspecies as **boyeri,** was listed by all the earlier workers, and has been intercepted in the metropolitan area and on mango blossoms at Mayagüez. Mr. Wm. P. Comstock (1944–487) lists it from Arecibo, Aibonito, Maricao and Coamo, it being a common species in all parts of Puerto Rico as it is in Hispaniola.

Thecla bubastus Cramer, of which Messrs. Comstock and Huntington (1943–79) describe the local subspecies under the name of **ponce,** had not previously been reported from Puerto Rico, but Mr. Wm. P. Comstock lists collections from many coastal localities in Puerto Rico, as well as from the Virgin Islands and many of the Lesser Antilles.

Thecla cardus Hewitson listed by all the early workers from Puerto Rico, is considered by Mr. Wm. P. Comstock (1944-492) to be a possible misidentification for *Thecla christophei* Comstock and Huntington (1943-85) from Hispaniola.

Thecla celida Lucas, of Cuba, was listed by Drs. Dewitz and Gundlach and Herr Möschler from Puerto Rico, of which Messrs. Comstock and Huntington (1943–76) describe the local subspecies under the name **aibonito,** the type from Aibonito.

Thecla columella arecibo Comstock and Huntington (1943–81) was listed, according to the opinion of Mr. Wm. P. Comstock (1944-490), under the name of *Thecla cybira* Hewiston by Drs. Dewitz and Gundlach and Herr Möschler from Puerto Rico, and the identifications by Dr. Wm. Schaus of interceptions at Arecibo and Vega Baja as *Callicista columella* F. and *Thecla eurytulus* Hübner also refer to this subspecies. The type is from Guayanilla, others from Arecibo and Coamo.

Thecla limenia Hewitson, originally described from Jamaica, Cuba and Santo Domingo, was listed by all the early workers from Puerto Rico, and Mr. Wm. P. Comstock (1944-491) lists specimens from many coastal points.

Thecla maesites maesites Herrich-Schäffer was listed by all the earlier workers, and also, not in synonymy *Thecla telea* Hewitson: the continental subspecies, according to Mr. Wm. P. Comstock (1944-488). The latter was identified from Puerto Rico by Dr. Harrison G. Dyar as a *Eupsyche.*

Thecla simaethis simaethis (Drury), listed by all the earlier workers from Puerto Rico, was described from the Island of St. Kitts or "St. Christopher," and has recently been intercepted at Arecibo.

Leptotes cassius theonus (Lucas), was by the earlier workers listed as *Lycaena cassius* Cramer, and by Dr. Wm. Schaus identified from material reared from lima beans at Isabela as *Lycaena theonus* Lucas. "The Larvae of *Lycaena theonus* Lucas feed on the Buds and Flowers of Lima Bean and *Crotalaria incana* in Puerto Rico" (Jour. Agr. Univ. P. R., **18** (3): 435, ref. 1. Río Piedras, (October 1934) is the first local record for the greenish, slug-like caterpillars of this little grey-blue and whitish butterfly, altho Mr. S. C. Bruner had previously noted its attack on the pods of lima beans in Cuba. The wild host plant occurs widely in coastal Puerto Rico, and the butterflies are to be expected in exceptional abundance in commercial plantings of lima beans. Mr. Wm. P. Comstock noted collections on El

Yunque as well as at Ponce, Tallaboa, Guayanilla and Ensenada. He presumes that it was "a very dark phase" of this species (1944-495) which Mr. E. G. Smyth captured at Camuy which Dr. Wm. Schaus identified as *Lycaena marina* Reakirt: a continental species not known to occur in the West Indies. All of these specimens show "the greater prominence and larger size of the marginal eye-spots on the underside of the hindwings."

Hemiargus ammon noëli Comstock and Huntington (1943-99), the subspecies originally described from Hispaniola and named in honor of the Haitian entomological illustrator: Mr. V. Pierre-Noël, was collected by Dr. F. E. Lutz on Mona Island. Altho Dr. Lutz found but a single male, it is really quite common on Mona, Prof. J. A. Ramos (1947–53) listing the collection of numerous specimens from Uvero and Sardinera Beaches. It was this species which Mr. Carl Heinrich identified as "near *zachaeina* B. & D.," collected by Dr. Luis F. Martorell there in April 1940.

Hemiargus ammon (Lucas) **woodruffi,** the subspecies described by Messrs. Comstock and Huntington (1943-100) from the Island of Anegada, British Virgin Islands, is represented in the AMNH collection by four males from San Juan, Puerto Rico.

Hemiargus hanno (Stoll), the local subspecies which Messrs. Comstock and Huntington (1943-106) described under the name of **watsoni,** was listed by all the earlier workers and is P. R. 132 in Van Zwaluwenburg's list. It was collected by Mr. Thos. H. Jones in 1914 near Tortuguero Lagoon as identified by Dr. Harrison G. Dyar, and has been repeatedly intercepted since in all parts of the Island. As *Lycaena filenus* (Poey), Prof. Wm. T. M. Forbes identified for Mr. Cesario Pérez the adults which he had reared from larvae feeding on the buds, flowers and seeds of "habichuela parada" (*Macroptilium lathyroides*). The upperside of the wings of the male are bright violet-blue, their outer margins black-brown with white fringes; those of the female are dark brown, suffused with blue at the bases.

Hemiargus isola isola (Reakirt) is known from Puerto Rico, according to Mr. Wm. P. Comstock (1944-498), from a single male captured by Mr. F. E. Watson at Tallaboa, July 23, 1914.

Hemiargus bornoi Comstock and Huntington, originally described from Haiti, is known from Puerto Rico, according to Mr. Wm. P. Comstock (1944-498) a single specimen captured by Dr. Frank E. Lutz at Ensenada, June 1915.

Pieridae: the Sulfurs and the Whites

Dismorphia spio (Latreille), listed from Puerto Rico by all the earlier writers as a *Leptalis*, is a narrow-winged butterfly of the higher mountains, its brownish-black wings banded with bright orange or bright yellow, or both yellow and orange. Mr. E. G. Smyth found it common near Ma-

meyes on the lower slopes of El Yunque during August, but altho listed from Manatí, Añasco and Mayagüez, most collections have been made high in the mountains at Indiera, or towards the top of El Yunque or El Duque. Nothing is known of the immature stages, but the caterpillar presumably feeds on some endemic plant common to the mountains of all the Antilles.

Anteos maerula maerula (Fabricius), listed as a *Gonepteryx* by the earlier writers, was reared by Dr. Gundlach from larvae feeding on species of *Cassia*. Dr. Luis F. Martorell found numerous larvae feeding on the foliage of "flor de San José" (*Isandrina emarginata*) on the lower slopes of the mountains north of Salinas, which transformed to plump pupae showing on the wingpads greatly enlarged spots of the distinctive black spot characteristic of the wings of the adults. The wings of the male are sulfur-yellow, those of female may be yellow or greyish-white; the spot in the center of the forewing is black; of the hindwing, orange half-circled with black. The determination of the reared adults was by Mr. W. D. Field. The only other recent record from Puerto Rico is of a specimen from Mayagüez, cited by Mr. Wm. P. Comstock (1944-503). Concerning the record of *Anteos* (*Gonepteryx*) *clorinde* Godart ascribed to Dr. Dewitz in "Insectae Portoricensis" (1923-146), Mr. Comstock states that it does not occur in the original paper.

Phoebis (Phoebis) sennae sennae (Linnaeus) is listed from Puerto Rico by Drs. Stahl, Dewitz and Gundlach under the older name of *Callidryas eubule* L., the latter noting "la oruga se cría principalmente en la *Cassia occidentalis*." Mr. Thos. H. Jones reared caterpillars from this host at Río Piedras, and this record was on Van Zwaluwenburg's list as P. R. 1423. Dr. Stuart T. Danforth (1926–23) notes it as one of the common butterflies around Cartagena Lagoon, and Prof. J. A. Ramos found adults on Mona Island. At Hda. Santa Rita, Guánica, the caterpillars were reared eating the flowers of "talantala" (*Herpetica alata*), and distinctly avoiding the tough leaves. The adults come to these flowers apparently in search for nectar, and retaliate for their difficulty in getting it by laying their eggs on the closely appressed flowers. The wings of the males are clear, bright sulfur-yellow above; those of the females vary from yellow to cream, their outer margins brownish and with an orange-centered brownish ring in the discal cell of the forewing, most Puerto Rican individuals being of the pale form. In "A Revision of the Genus Phoebis (Lepidoptera)" (American Museum Novitates No. 368, pp. 22, many ref. New York, September 5, 1929), Mr. F. Martin Brown describes this pale female as *sennalba*, the type from Cuba, the paratype from San Juan, Puerto Rico: a form of *Phoebis eubule* Linnaeus of the West Indian race of *sennae* Linnaeus. The caterpillar is parasitized by the Chalcid wasp *Spilochalcis eubule* (Cresson).

Phoebis (Phoebis) argante (Fabricius), of which Mr. Wm. P. Comstock

(1944–506) describes the local subspecies under the name **martini,** was listed by all the earlier writers as a *Callidryas.* Dr. Wm. Schaus identified the bright yellow adult which was reared from a green caterpillar found feeding on the leaves of *Inga vera* at Cayey as *C. rorata* Butler: a female aberration of *argante* F., considered by Mr. Wm. P. Comstock (1944–508) as "confined mainly to Hispaniola." The ground color of the wings of the males is orange-yellow, with dashes of black at the ends of some of the veins; that of the females is dull yellow, often much mottled with reddish brown, and with brownish spots at the ends of some veins and towards the apex of the forewings. While it is possible that the caterpillars may feed on the leaves of some other host than the coffee shade tree, *Inga vera,* all adults have been collected in the coffee regions: Mayagüez, Añasco, Camuy, Adjuntas, Orocovis and Cayey.

Phoebis (Phoebis) agarithe (Boisduval), of which the Antillan race was described by Mr. F. Martin Brown (1929–15) under the name **antillia,** was listed as a *Callidryas* by Drs. Stahl, Dewitz and Gundlach and by Herr Möschler, Dr. Gundlach pointing out its differences from the preceding species. In Van Zwaluwenburg's list it is P. R. 1428. The AMC collection contains specimens from Yabucoa, La Plata and Mayagüez; Prof. J. A. Ramos has collected it at Lajas and at Cartagena Lagoon; and Mr. Cesario Pérez reared it from larvae on *Pithecolobium dulce* at La Muda, between Río Piedras and Caguas.

Phoebis (Phoebis) philea (Johansson) was listed from Puerto Rico by the earlier workers as *Callidryas thalestris* Hübner, which Mr. Wm. P. Comstock (1944–510) considers distinct. Herr Möschler (1880–94), presumably quoting Dr. Gundlach, notes "raupe auf Leguminosen: *Poinciana pulcherrima, Cassia fistula, grandis, occidentalis.*" Mr. F. Martin Brown (1929–9) gives many names in synonymy of this, the largest of the species of *Phoebis* which occurs in Puerto Rico, but apparently it is so rare that Mr. Comstock had only a single specimen: from Aibonito.

Phoebis (Rhabdodryas) trite (Linnaeus), of which Mr. F. Martin Brown described the Antillean race (1929–20) under the name of **watsoni,** the type from Santo Domingo, others from Cayey and Adjuntas, Puerto Rico, was listed as a *Callidryas* by all the earlier writers. Adults have since been taken at San Juan and Mayagüez.

Phoebis (Aphrissa) godartiana (Swainson) is listed from Puerto Rico by Mr. F. Martin Brown on page 5 of his "A Revision of the Genus *Aphrissa*" (American Museum Novitates No. 454, pp. 14, fig. 15. New York, Februry 9, 1931), altho no recent collection has been made here

Phoebis (Aphrissa) statira cubana d'Almeida was listed from Puerto Rico by Drs. Dewitz and Stahl as *Callidryas evadne* Hübner, and by Dr. Gundlach and Herr Möschler as *Callidryas statira* Cramer, the caterpillar

feeding on Cassias, and also by all of them as *Callidryas neleis* Boisduval, not in synonymy. Mr. F. Martin Brown (1931–7) indicates the synonymy of these and others, considering "*neleis* Boisduval must be restricted to the West Indian race." Mr. Wm. P. Comstock (1944–514) states that "*neleis* is confined to Cuba," and that the adult reared from larva feeding on tender leaves of "quenepa" (*Melicocca bijuga* L.) at Río Piedras "was determined erroneously by Mr. F. E. Watson." The confusion is more than a matter of names, for quenepa is not a Leguminous tree. Mr. Francisco Seín noted larvae on quenepa in November 1939, but from the chrysalids they formed, emerged only parasitic Chalcid wasps: *Spilochalcis eubule* (Cresson). It is apparent that the wasps are unselective as to the species of *Phoebis* attacked, and are not restricted to the species after which they are named. The adult sent to Mr. Watson was reared in July 1936, and caterpillars have been noted every year since on the same quenepa tree, feeding on the tender leaves. Adults appear every June, the females ovipositing as soon as the tender leaves appear, but no second generation of caterpillars develops on this particular quenepa. Is it possible that during the remainder of the year other generations of caterpillars feed on *Cassia*? The adults of "both sexes have a ground color of sulphur-yellow on both surfaces," the male having no color markings, the female only a few spots, mostly on the under surface.

Kricogonia castalia (Fabricius) is a comparatively rare butterfly in Puerto Rico at the present time, but it was listed by all the earlier writers, Dr. Dewitz using the generic name *Gonepteryx*. Dr. Gundlach gives an extensive synonymy, making no distinction between this species and *lyside*, but of *Rhodocera terissa* noting "una mancha quadrilonga negra extendida desde el borde anterior de las alas posteriores hacia el disco." He gives the distribution as Cuba, Jamaica, Florida and Texas, and states that it "vive más bien cerca de la costa que en el interior." Whether this implies that he noted a mass migration along the coast of Puerto Rico is uncertain, but such has been recorded from Haiti (Entomological News, **38** (4): 97–100. Philadelphia, April 1927), and it might well have occurred in Puerto Rico when the host plant of the caterpillars, lignum-vitae or "guayacán" (*Guaiacum officinale*), was more abundant than at present. Guayacán grows almost exclusively in the more xerophytic areas of the south coast of Puerto Rico, the collection by Mr. F. E. Watson from Quebradillas, reported by Mr. Wm. P. Comstock (1944–517), being most exceptional, while those from Lajas and Ensenada are to be expected. Mr. Cesario Pérez collected adults, as identified by Mr. W. D. Field, in January 1942 at Salinas, a very few of these black-lined specimens being distinguished by him among swarms of cabbage butterflies.

Kricogonia lyside (Laterille) is distinguished by Mr. Wm. P. Comstock

(1944–517) from *castalia* on the basis of larger size, "the black bar on the hindwing is usually narrower (1 mm. wide) and tends to obsolescence and disappearance," and on the underside of the hindwings "there is a raised line of dull yellow scales about 0.5 mm. wide." He admits, however, that "the male genital armature is indistinguishable." He identifies Puerto Rican specimens from Coamo, Guayanilla and Lajas.

Eurema (Eurema) daira ebriola (Poey), listed under this specific name from Puerto Rico by Drs. Stahl and Dewitz, is called *Terias jucunda* (Boisduval and LeConte) by Dr. Gundlach (with *ebriola* in synonymy); "La oruga se encuentra sobre el *Desmodium.*" Mr. Wm. P. Comstock (1944–520) records collections from Puerto Rico at Mameyes, El Yunque and Coamo, and wide distribution in the other Antilles.

Eurema (Eurema) elathea (Cramer) has been reared from a little green chrysalis found on a *Zamia* leaf at Guánica Insular Forest, May 31, 1942. Mr. Wm. P. Comstock (1944–521) records collections at Ensenada, Tallaboa, Ponce and on El Yunque, as well as in many of the other Antilles.

Eurema (Eurema) palmira palmira (Poey) was listed from Puerto Rico by all the earlier workers as a *Terias*, Dr. Gundlach noting "su oruga sobre el *Desmodium.*" It has been intercepted at Luquillo and Vega Baja, and Prof. J. A. Ramos (1947–53) collected these little black-margined yellow butterflies on Mona Island, of which the typical form occurs in most of the Antilles.

Eurema (Pyrisitia) dina (Poey) is represented in Puerto Rico, according to Mr. Wm. P. Comstock (1944–525) by the subspecies **sanjuanensis**, which Mr. Frank E. Watson described as "A new *Eurema* from Puerto Rico" (American Museum Novitates No. 971, pp. 2, New York, April 25, 1938): the holotype from San Juan.

Eurema (Pyrisitia) lisa euterpe (Ménétriés) was identified by Dr. Harrison G. Dyar for specimens collected by Mr. Thos. H. Jones at Río Piedras in 1912, and near Tortuguero Lagoon in 1914, forming the basis for the entry as a *Terias* in Van Zwaluwenburg's list: P. R. 135. This is one of the common butterflies of Puerto Rico, having been repeatedly intercepted along the north coast from Arecibo to Luquillo, and found in great abundance at Colonia Jauca, Salinas, by Dr. Luis F. Martorell in September 1939. As *Xanthidia lisa* Boisduval and LeConte (= *Terias sulphurina* Poey), it is listed by Dr. Gundlach, who notes its extensive distribution in the West Indies, continental United States and Canada, and that according to Boisduval, "la oruga vive en la *Cassia* y *Glycine.*" Prof. J. A. Ramos (1947–53) records collecting adults on the plateau of Mona Island. "The males have a bright yellow ground color on both surfaces, while the females may vary from pale yellow to white. In both sexes, the apical and outer marginal area of the forewing on the upperside is black-brown. The

hindwing of the male has a black-brown border about 0.5 mm. wide," according to Mr. Wm. P. Comstock (1944–524).

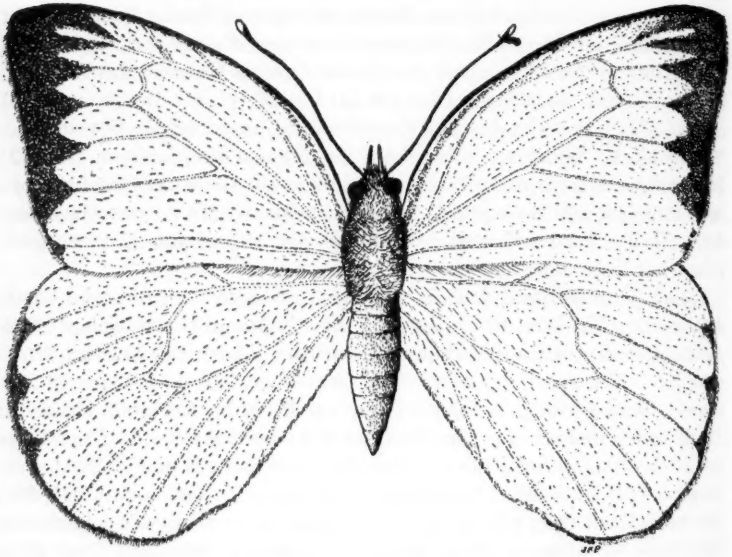
Eurema (Pyrisitia) nicippe (Cramer) is considerably larger than others of this genus, having deeply black bordered wings of bright orange. Mr. Wm. P. Comstock (1944–525) cites collections at Dorado and Indiera, and Prof. J. A. Ramos has additional specimens from Mayagüez.

Eurema (Pyrisitia) portoricensis was described by Dr. Hermann Dewitz (1877–237) as a *Terias citrina*, var. *nova* from type material presumably collected by Dr. Gundlach in the Mayagüez region of Puerto Rico. Neither Dr. Gundlach nor Herr Möschler listed it as more than a variety, but Dr. A. B. Klots in "A Revision of the Genus *Eurema* Hübner (Lepidoptera: Pieridae)" (Ent. Americana (n. s.) **9** (3) 99–163, pl. 4. Brooklyn, 1929) on page 132 gives it the status of a valid species, found only in Puerto Rico. Mr. Frank E. Watson in describing his *Eurema sanjuanensis* (1938–2) differentiates it from *portoricencis*, "which has the outer margin of the primary rounded, and both primary and secondary with a narrow black border." It has been collected generally in the mountains, but one individual has been intercepted at Manatí.

Appias (Glutophrissa) drusilla (Cramer), of which the subspecies **boydi,** described by Mr. Wm. P. Comstock in his "Notes on the Subgenus *Glutophrissa*, Genus *Appias* (Lepidoptera, Pieridae)" (American Museum Novitates No. 1236, pp. 6, fig. 2, ref. 25. New York, July 9, 1943) from Hispaniola, occurs widely in Puerto Rico, was listed by Dr. Stahl simply as *Pieris ilaire* Godart. Dr. Gundlach used the generic name of *Daptonoura* (= *Tachiris margarita* Hübner), and the latter name is in Van Zwaluwenburg's list: P. R. 1428. According to Mr. Wm. P. Comstock (1944–527) this whitish butterfly with basal and marginal infuscation was collected by Dr. Frank E. Lutz on Mona Island in February 1914, and Prof. J. A. Ramos (1947–53) found numerous others there thirty years later. In Puerto Rico this predominantly xerophytic butterfly is most abundant around Cartagena Lagoon and at Ensenada, but has also been collected at Quebradillas, Arecibo and even on El Yunque.

Appias (Glutophrissa) punctifera was described by Sr. R. Ferreira d'Almeida in his "Revisao do Género *Appias* (subgen. *Glutophrissa* Butl.)" (Bol. Biol., **4** (1): 50–66, pl. 2. Río de Janeiro, 1939) as a distinct and valid species for the four entirely white females with a prominent spot on the forewing, which Dr. Dewitz had considered hybrids or throwbacks of *Tachiris margarita* Hübner or *T. molpadia* Hübner (1877–234 and 245), and basing "his name on Dewitz' description and figures, apparently without specimens." Mr. Wm. P. Comstock (1943–5) redescribes both sexes, noting males from Orocovis and Coamo, and occurrence in St. Thomas and St. John of the U. S. Virgin Islands.

Ascia monuste (Linnaeus), the common white cabbage butterfly, is much better known as *Pieris*, under which generic name it was listed from Puerto Rico not only by the early systematic workers, but also by Mr. W. V. Tower (1908–35) as a pest of cabbage, radish, turnip, kale and mustard, by Mr. Thos. H. Jones (1915–6) on horse radish and *Cleome spinosa* (= *C. gynandra*), and by Dr. Richard T. Cotton (1918–281) who made fresh illustrations of egg, larva and adult from material reared on cabbage.



The Puerto Rican variety of the common Cabbage Butterfly, *Ascia* (or *Pieris*) *monusta eubotea* (Latreille), twice natural size. (The hind wings are not as large as here shown by José F. Pietri.)

Mr. Wm. P. Comstock (1944–529) notes that the typical continental subspecies, **A. m. monuste** (Linnaeus) may occur in Puerto Rico by migration, but the bulk of the insular population is **A. m. eubotea** (Latreille), mixed with and hybridized with **A. m. virginia** (Latreille), the common subspecies of the Lesser Antilles. The record of *Pieris joppe* Boisduval by the early workers refers to the subspecies *eubotea*. The hairy, greenish-yellow caterpillars feed not only on the leaves of common economic cruciferous crops, but Dr. Luis F. Martorell noted them on tender shoots of "burro" (*Capparis portoricensis* and *C. coccolobifolia*) in the mountains between Cayey and Salinas. The plant on which they were feeding at Indiera in January 1923 could not be identified, but in June 1937 they were enormously abun-

dant in all the cane fields from Guánica to Guayanilla, feeding on the weed "jazmín de río" (*Cleome gynandra*). Many pupated on cane leaves, yet but few butterflies emerged, for most of the chrysalids were brown with parasitism by *Brachymeria incerta* (Cresson). When this weed is completely devoured locally by the caterpillars, or weeded out, they complete their growth feeding on anything else available, in January 1940 on Mona Island the crop attacked being onions. Formerly the control of these caterpillars might pose a serious problem, for insecticides sprayed on cabbage did not adhere, and there was always the subsequent danger of later human consumption. One can obtain immediate results with DDT and chlordan and some of the other newer insecticides, which kill so promptly that their adhesion to the plant need be for only a few minutes to be effective.

Ascia (Ganyra) josephina Godart, of a variety collected from the south coast of Puerto Rico by Herr Leopoldo Krug, was described by Dr. Hermann Dewitz under the name of *Pieris josephina* var. **krugii** (1877–235). It was listed but not collected by Drs. Stahl and Gundlach, and by Herr Möschler. It is apparently confined to the more xerophytic southwestern corner of Puerto Rico, Prof. J. A. Ramos having found it at Lajas, June 13, 1942, according to Mr. Wm. P. Comstock (1944–532) who identified the specimen.

Papilionidae: The Swallowtails

Papilio polydamas Linnaeus, of which the local subspecies: **thyamus** Rothschild and Jordan, was described from St. Thomas, was listed from Puerto Rico by all the earlier workers, Dr. Gundlach, in addition to notes on continental distribution and in Cuba, states "la oruga se cría en especies de *Aristolochia*. Exhala un olor a almizcle." The local subspecies does not occur in the other Greater Antilles, but in the U. S. and British Virgin Islands, not in Lesser Antilles farther south. The adult is a fine large black, non-tailed butterfly, with a submarginal row of yellow darts and marginal crescents on the forewing, a submarginal row of greenish-yellow broad crescents and marginal crescents on the hindwings. Mr. Thos. H. Jones collected an adult near Laguna Tortuguero in July 1914; Prof. J. A. Ramos reared them at Mayagüez more recently, and Mr. Wm. P. Comstock (1944–533) records collections from San Juan, Santurce and Naguabo, with descriptions of the immature stages. Badly worn adults have repeatedly been noted on the beach at Mameyes, behind the protective margin of seagrape, visiting flowers of botoncillo and mingling with smaller butterflies.

Papilio aristodemus aristodemus Esper, originally described from Cuba as *Papilio Eques Achivus aristodemus* Esper, was listed from Puerto Rico by Drs. Stahl and Dewitz, and as *Papilio cresphontinus* Martyn by Dr.

Gundlach, with the other name in synonymy, and by Herr Möschler. Mr. Cesario Pérez collected one somewhat faded adult in October 1940 in what he called "Rexach": the hills beside Laguna San José which the stone-crushers are reducing to level land. Black-brown in ground color, the hindwing strongly tailed, both wings above bear a transverse yellow band and a submarginal row of yellow lunules, that on the forewing being bent at right angles towards the costa. Of the Floridian subspecies the larval host plant is torchwood (*Amyris elemifera*), according to Mr. Wm. T. Comstock (1944–536) quoting Miss Florence Moore Grinshawe's "Place of Sorrow" (Nature Magazine, **33:** 565. Washington, D. C., 1940).

Papilio androgeus Cramer, of which the local subspecies **epidaurus** Godman and Salvin was first identified from Puerto Rico by Mr. Frank E. Watson, was listed by Drs. Stahl, Dewitz and Gundlach as *Papilio polycaon* Cramer, the latter giving synonymy, and noting "su oruga se cría en especies del género *Citrus*." The caterpillar the "orange puppy" of citrus growers, is discussed as a minor pest of citrus in "An Economic Entomology of the West Indies" (1933–448), having been noted in Puerto Rico at Río Piedras, Manatí, Lares and Isabela, Mr. Wm. P. Comstock (1944–536) listing collections at Mayagüez, Maricao and Ponce. The adults are possibly the largest butterflies present in Puerto Rico, brownish-black and tailed, the males with a very broad yellow transverse band across both wings, the females with the forewings only in a limited area suffused with yellow, the hindwings extensively marked with greenish-yellow.

Papilio pelaus imerius Godart was listed as *Papilio pelaus* Fabricius by Drs. Stahl, Dewitz and Gundlach, the latter noting "he cogido una crisálida fijada en el tronco de un *Xanthoxylum*, y probablemente la oruga se cría en esta mata." In this supposition Dr. Gundlach was entirely correct, for larvae on "cenizo" (*Zanthoxylum martinicense*) have been noted at Martin Peña, Cayey and Barranquitas, and reared to adult. Even when fully grown the larvae are closely gregarious, crowding each other and hugging the trunk of the tree when not feeding, their purplish and greenish-brown bodies marked with extensive creamy spots and minor smoky areas, giving no indication when a lizard runs over the group, or an ant bites one. The adults are brownish-black, tailed butterflies, with a narrow transverse band across the forewings, marginal yellow crescents larger on the hindwings and submarginal orange crescents. One intercepted at Palo Seco was identified by Dr. Wm. Schaus as a new local race.

Hesperiidae: the Skippers

Phocides pigmalion pyres (Godman and Salvin), originally described from Hispaniola and Puerto Rico as *Erycides pyres* (1879–154), has not since been found outside of Hispaniola.

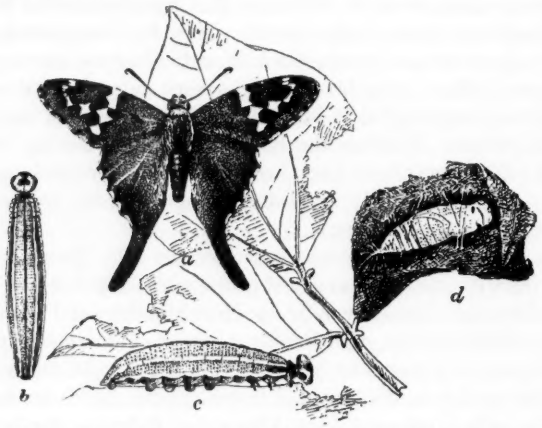
Polygonus lividus Hübner was originally described as *Papilio amyntas* Fabricius from America, and listed from Puerto Rico as a *Goniloba* by Drs. Dewitz and Stahl, and as *Hesperia amyntas* by Dr. Gundlach and Herr Möschler. Dr. Gundlach notes "he criado la oruga en *Lonchocarpus*," and in the Report of the Experiment Station at Mayagüez for 1937 (1938–93), the rearing of adults, determined by Mr. J. F. Gates Clarke as *Acolastus amyntas*, from larvae feeding on the leaves of semi-commercial plantings of *Derris eliptica*, is recorded. "Ventura" (*Ichthyomethia piscipula*) is the endemic host, larvae having been found at Cabeza de San Juan, in the northeastern corner of the Island, at Pt. Cangrejos, and at Boquerón, in the southwestern corner of the Island. They live in a folded-over leaf and have flat, heart-shaped heads, black in earlier instars, lemon yellow in the final instar, with a large black spot on each side of the dorsal cleft. Adults have been intercepted at Manatí and Mayagüez, and may be presumed to be present wherever the host plant grows, having been very abundant in 1923 especially at Boquerón. They are brownish-black, with three chalky white irregularly quadrangular spots on the forewings, and three smaller ones near the apex.

Proteides mercurius pedro was described by Dr. Hermann Dewitz (1877–242) from Puerto Rican material presumably collected by Dr. Gundlach as *Goniloba idas* Cramer, var. *pedro*. Herr Möschler and Dr. Gundlach use the name *Eudamus idas*, with *Papilio mercurius* Fabricius in synonymy. This butterfly also was reared by Mr. H. K. Plank at the Mayagüez Station, the caterpillar feeding on the leaves of *Derris eliptica*, and it has been intercepted in a grapefruit grove at Vega Alta and at Peñuelas, the latter being determined by Dr. Wm. Schaus as *Proteides jamaicensis* Skinner. It has four pale whitish spots in a row on the black-brown forewing, and three other smaller ones, with extensive basal orange cilia.

Proteides zestos Geyer was listed from Puerto Rico by Drs. Dewitz and Stahl as a *Goniloba*, and by Herr Möschler and Dr. Gundlach as *Aethilla anaphus* Cramer. According to Mr. Wm. P. Comstock (1944–544) the hyaline spots on the forewing are placed as with *P. m. pedro*, but are amber-colored. He lists numerous records from Puerto Rico, in addition to the interceptions at Cidra and Ponce, and notes distribution from Florida to Barbados.

Urbanus proteus (Linnaeus), listed by the earlier workers in Puerto Rico as a *Goniurus*, and in Van Zwaluwenburg's list (901), by Dr. C. W. Hooker (1913–14), Mr. Thos. H. Jones (1915–7) and Dr. Richard T. Cotton (1918–277) as an *Eudamus*, is a common but not especially abundant or economically important pest of beans and cowpeas. The caterpillars may also feed on the leaves of beggar weed (*Meibomia purpurea*), and an adult reared from the leaves of "bejuco de San Pedro" (*Stigmatophyl-*

lum lingulatum) at Loíza in 1923 is quite typical and indistinguishable from those of which the caterpillars fed on the normal hosts. It occurs in all parts of the Island, but despite its distribution "from the southern United States to Argentina and throughout the West Indies," according to Mr. Wm. P. Comstock (1944–545), it has not been found on Mona Island, the specimens collected there by Dr. Luis F. Martorell proving to be the following species. This long-tailed Hesperiid is characterized by the whitish hyaline spots on the forewings and by the extensive basal yellowish-blue-green iridescent sheen above.



The Bean Hesperiid, *Urbanus proteus* (Linnaeus): *a*, adult, *b* & *c*, larvae, *d*, pupa, all natural size. (After Chittenden, U. S. D. A.)

Urbanus dorantes Stoll, of which Mr. Wm. P. Comstock (1944–546) describes the local subspecies of the Virgin Islands, Puerto Rico, Mona Island and Hispaniola as **cramptoni**, was listed from Puerto Rico by the earlier writers as an *Eudamus*, and an intercepted adult from lime flowers at Dorado was identified by Dr. Wm. Schaus as *Eudamus santiago* Lucas. The amber hyaline spots of the forewings are "distinctly reduced in size," and none of blue-green iridescent sheen of *proteus* appears. Despite the abundance of adults nothing is known of the immature stages. Prof. J. A. Ramos (1947–54) found these butterflies abundant on Mona Island, and those collected there by Dr. Luis F. Martorell in earlier years in abundance on the flowers of "corcho" (*Pisonia albida*) and of "ángela" (*Moringa oleifera*), in most cases have had their tails broken off, but were identified by Mr. Comstock as being typical of his subspecies. Dr. Martorell notes that they were "the most common insect coming to feed on the nectar of fresh blossoms" of these plants.

Astraptes anaphus Cramer, of which the Antillean subspecies was described from St. Vincent and Grenada as *Telegonus anausis* Godman and Salvin, was listed from Puerto Rico by Drs. Dewitz and Stahl as a *Goniloba*, and by Dr. Gundlach and Herr Möschler as an *Aethilla*. The only recent collections are one by Mr. Miguel A. Díaz at Santurce, and one intercepted in a grapefruit grove at Vega Alta.

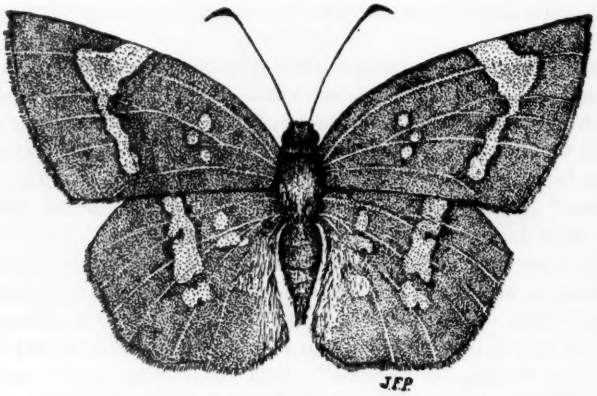
Astrapates talus (Cramer) is listed from Puerto Rico by Dr. Dewitz as a *Goniloba*, and by Herr Möschler and Dr. Gundlach as an *Eudamus*, the latter noting "la oruga se cría en *Guarea trichilioides*." This is "guaraguao": an important cabinet-wood tree. Mr. Wm. P. Comstock (1944–550) records the recent capture of two small males at Mayagüez, but it is unquestionably so rare that its caterpillars have never been noted by the foresters.

Pyrgus syrichtus (Fabricius) is listed from Puerto Rico under this name by the earlier workers, Dr. Gundlach noting "la oruga se cría en Malvaceas, v.g. *Sida*." Dr. Dewitz in addition gives the name *Pyrgus orcus* Cramer, of which the distribution, according to Mr. Wm. P. Comstock (1944–551) "is from Dominica southward—with an extensive South American range to Argentina." In appearance this Hesperiid is very different from most others, being dark grey with numerous white spots. Mr. Thos. H. Jones collected it on El Duque and at Laguna Tortuguero, and presumably its distribution is in all parts of the Island, altho there are no records from the south coast. Dr. Luis F. Martorell collected adults on Mona Island. Mr. E. G. Smyth photographed and reared larvae which he had found at Río Piedras feeding on "escoba" (*Sida carpinifolia* or *S. antillensis*). "The head of the mature larva is black, the collar dark brown, with three light spots, and the body yellowish green, thinly pilose. The pupa, about 15 mm. long, is bright reddish-brown, greenish on the anal segments and wing-cases, and thickly pilose." The "form **montivagus** Reakirt is as common as *syrichtus* in Porto Rico," according to Mr. Wm. P. Comstock (1944–551).

Pyrgus crisia crisia Herrich-Schäffer is listed from Puerto Rico by the earlier workers, but has not been collected recently.

Achylodes papinianus Poey, of which the local subspecies is described by Mr. Wm. P. Comstock (1944–552) from Dominica, Guadeloupe, the Virgin Islands and Puerto Rico under the name of **minor**, was listed as *A. thraso* Hübner by the earlier writers, although Dr. Gundlach is sure the species "no son ambos iguales." More recently it is called *Eantis*, and as *Eantis thraso* is in Van Zwaluwenburg's list (22) on orange, noted by Dr. Richard T. Cotton (1917–21) as "fairly common in some (citrus) groves," and in "Insectae Portoricensis" (1923–149) the larva and chrysalis are described, with record of the larvae found feeding on the leaves of "espino

rubial" (*Zanthoxylum monophyllum*) at Boquerón. It occurs in all parts of Puerto Rico, Prof. J. A. Ramos having specimens from Cartagena Lagoon, and larvae having been noted on wild orange at Indiera, Lares and Aibonito; on grapefruit at Isabela, Vega Alta, Pt. Salinas (Palo Seco) and Río Piedras. It is hardly an economic pest in mature grapefruit trees, but may become abundant in nurseries warranting a single application of arsenate of lead, as recommended in "An Economic Entomology of the West Indies" (1933–449). "Its head is large, prominent and heart-shaped, being attached to the body by such narrow segments as to appear as though carried on a neck. The light, yellowish-green body tapers to either end,



Adult of the Citrus Hesperiid, *Achylodes papinianus minor* Comstock, twice natural size. (Drawn by José F. Pietri.)

striped with dark green along the middle of the back and more broadly with bright yellow along the sides. Even when very small, it invariably bends over a bit of leaf to form a shelter, lined with silk, in which to live and feed. As the caterpillar grows larger, it forms an ever larger temporary shelter, eventually using an entire leaf. Within this structure, it transforms to a chrysalis, cloudy green in color and densely covered with whitish bloom. The adult butterfly is most disappointingly dull and prosaic in coloration: brown, mottled with somewhat ligher-colored lines and spots."

Ephyriades arcas (Drury), originally described from the Island of St. Kitts as a *Papilio*, was listed from Puerto Rico by Drs. Dewitz and Stahl as *Antigonus flyas* Cramer, and in addition Dr. Stahl lists *Nisoniades brunnea* Herrich-Schäffer, which Mr. Wm. P. Comstock states (1944–556) is confined to Cuba, and the nomen nudum *A. ptreus* Cramer. Dr. Gundlach gives a long synonymy, noting "la oruga se cría en especies de la familia de

las apocíneas, v. g. del género *Echites*." Apparently the female, so different in appearance that she has been named *Melanthes zepodea* Hübner, is not a discriminating botanist in the selection of a host on which to oviposit, for larvae have been reared feeding on the leaves of "bejuco de San Pedro" (*Stigmatophyllum lingulatum*) at Pt. Cangrejos, Loíza and at Boquerón; on "olaga" (*Malpighia fulcata*) at Maunabo; and on leaves of "ceiba" (*Ceiba pentandra*) at Salinas. In "Insectae Portoricensis" (1923–149), as a *Brachycorene*, the immature stages are described, and the record of so many adults reared that the identity of the velvety, dark brown male and the lighter brown female, with silvery spots on the forewings, is again proved beyond possibility of dispute.

Erynnis zarucco (Lucas), originally described from Cuba as a *Thanaos*, is listed from Puerto Rico by Dr. Stahl as *Nisoniades jaruco* Lefebvre (in Lucas) with *N. juvenalis* H. S. in synonymy.

Hylephila phyleus (Drury), originally described from St. Kitts and others of the Lesser Antilles, was listed from Puerto Rico by Dr. Dewitz as a *Pamphila*, by Herr Möschler and Dr. Gundlach as a *Hesperia*. It is in Van Zwaluwenburg's list as P. R. 130, and has been repeatedly intercepted since in all parts of humid Puerto Rico—a common little skipper of yellowish-orange and dark brown. Mr. E. Stuart Paton in "The Life-History of some Jamaican Hesperiidae" (Jour. Institute Jamaica, **2** (5): 435–441, pl. 1. Kingston, 1897) describes the habits of the greenish-brown larva, which burrows in the earth by day and comes out at night to feed on the grasses *Paspalum conjugatum* and *Panicum sanguinale*.

Polites dictynna (Godman and Salvin), identified as a *Thymelicus* by Dr. Wm. Schaus from a specimen intercepted in an orange grove at Pueblo Viejo. This may be what Dr. Stahl listed as *Goniloba cosinia* H. S., mistakenly in synonymy with *Thymelicus brettus* Boisduval.

Atalopedes mesogramma (Latreille), of which Mr. Wm. P. Comstock (1944–559) described the local subspecies under the name **apa,** was listed as a *Pamphila* by Drs. Dewitz and Stahl. Dr. Gundlach, following Herr Möschler, gives *Hesperia cunaxa* Hewitson in synonymy with *alameda* Lefebvre, this name also being given by Dr. Wm. Schaus to one of these little brown butterflies with extensive orange areas, collected by Mr. Thos. H. Jones in 1912, and to another intercepted at Villalba. The subspecies is quite common in the more humid areas of Puerto Rico and Hispaniola.

Wallengrenia otho (Smith & Abbot), of which Mr. Frank E. Watson in "New Hesperiidae from the Antilles (Lepidoptera: Rhopalocera)" (American Museum Novitates No. 906, pp. 10. New York, January 16, 1937) describes the new subspecies **mutchleri** from Puerto Rico, Mona and Desecheo Islands, St. Thomas and St. Croix of the Virgin Islands, and Hispaniola, was first listed from Puerto Rico by Dr. Dewitz as *Pamphilia*

druryi Latreille, and by Herr Möschler and Dr. Gundlach as *Hesperia druryi*. Indeed, the specimens collected here by staff members of the American Museum of Natural History and returned to Puerto Rico for record were labeled *Catia druryi* Latreille, but in "Insectae Portoricensis" (1923–151), the name *Catia otho* Smith and Abbot was used, the synonymy by Dr. Wm. Schaus. This little golden-brown skipper with orange spots was collected by Mr. Thos. H. Jones on El Duque, at Río Piedras and near Tortuguero Lagoon, and has since been intercepted in all parts of the Island, including Ponce, and on Mona Island by Dr. Luis F. Martorell on Sardinera Beach on March 30, 1940. In Puerto Rico the larva has not been noted, but in Santo Domingo it is "the smallest and most common Hesperiid caterpillar feeding on cane leaves, and also common on rice and other coarse-leaved grasses. The larvae are green with purplish-brown head, variably marked with silvery or greenish-yellow," as observed at Haina in 1921, and recorded under the name of *misera*: the Cuban subspecies.

Choranthus vittelius (Fabricius), first listed from Puerto Rico by Dr. Dewitz as a *Pamphila*, and by Dr. Gundlach and Herr Möschler as *Hesperia hübneri* Plotz, was identified as an *Atrytone* for Mr. Thos. H. Jones by Dr. Harrison G. Dyar, and this name has since been used for all records of the caterpillar as a minor pest of sugar-cane, Mr. E. G. Smyth (1919–143) mentioning also Sudan grass and other wild grasses as host plants. Mr. Jones noted that the larvae had twice been quite common on cane leaves at Río Piedras during the three years that he was in Puerto Rico, and apparently it was comparably abundant at the time that Mr. E. G. Smyth was conducting his tests on the transmission of mosaic disease. It has not been at all common since, not having been noted at all during the five year survey of eggs of sugar-cane moth-borer (1936–41). As observed by Mr. Jones, the caterpillar is 35 mm. long when fully-grown, with dull yellow, granular head banded with black, and robin's egg blue body, of nocturnal feeding habits, "resting by day in shelters of partly-eaten, folded-over leaves, held together with numerous strands of silk, in which, after filling in the ends with more silken strands, the opalescent, creamy yellow chrysalis is formed." "The adult is a small butterfly with brilliant, shining, chrome-yellow wings, margined with black, having an expanse of about 27 mm." This account was from his notes, published as "The Caterpillars which eat the Leaves of Sugar-Cane in Porto Rico" (Jour. Dept. Agr. P. R., **4** (1): 38–50, fig. 10. San Juan, January 1922). Adults have since been collected at Barceloneta and Cayey, and intercepted at Bayamón, Aibonito and Mayagüez, and others identified as *Atrytone portensis* Mabille by Dr. Wm. Schaus, intercepted at Bayamón and Arecibo.

Another Hesperiid larva reared on leaves of sugar-cane at Pt. Cangrejos

in 1920, about an inch long when fully-grown, its head "yellow with brown markings, its body opalescent grey-green, with two noticeable yellow spots on the twelfth segment dorsal and very short black hairs on the thirteenth segment," as reported in "The Minor Sugar-Cane Insects of Porto Rico" (Jour. Dept. Agr. P. R., **5** (2): 5–47, fig. 19. San Juan, April 1921), was identified by Mr. Carl Heinrich as possibly *Choranthus ammonia* Plotz, and later by Dr. Wm. Schaus as **Choranthus haitensis** Skinner.

Choranthus borinconus was described by Mr. Frank E. Watson as a *Godmania* (1937–9), the type from Aibonito, others from San Juan and Dorado, being the butterfly listed by Drs. Dewitz and Stahl as *Pamphila silius* Latreille, and by Herr Möschler and Dr. Gundlach as a *Hesperia.* Numerous interceptions of this butterfly have been made: at Ponce identified by Dr. Wm. Schaus as *Choranthus hesperia* Plotz, and at San Juan and Mayagüez as *Choranthus hübneri* Plotz, but as Mr. Watson had not described the female, it was not until Mr. Francisco Seín reared adults of both sexes from larvae feeding on the pinnae of areca palm that identification by Mr. J. F. Gates Clarke made possible the description of the male by Mr. Wm. P. Comstock (1944–563). They are quite different in appearance, the female having a ground color of "dark brown with ferruginous scaling" and yellowish subhyaline spots on the forewing, while the male is a shade of deep orange bordered with brown. The caterpillar differs from that of *C. vitellius* in that the four curving bands on the front of the head are dark brown ventrally, fading to dull orange above, only the thoracic half-collar black. As this is almost the only inset attacking the betel palm, *Areca catechu* L., it would be of considerable importance if at all abundant on such a popular ornamental.

Lerodea tripuncta (Herrich-Schäffer) is a little brown butterfly with three small white spots on the forewing, listed from Puerto Rico by Drs. Dewitz and Stahl as a *Cobalus*, and by Herr Möschler and Dr. Gundlach as a *Hesperia.* It has been intercepted on El Yunque, at Río Piedras, Quebradillas, Mayagüez and Ponce, apparently occurring in all parts of Puerto Rico, and collected on Mona Island by Dr. Luis F. Martorell, and by Prof. J. A. Ramos. According to Mr. Wm. P. Comstock (1944–566), "the larvae feed on Guinea grass and probably other grasses, pupation occurring in a cocoon formed of a rolled grass blade spun together with silk."

Calpodes ethlius (Cramer) was first noted in Puerto Rico by Dr. Gundlach. "La oruga se alimenta de las hojas de maranta y canna, y difiere por su forma, transparencia de la piel, y por la forma de la crisálida de las otras especies antillanas." It is number 1645 on Van Zwaluwenburg's list, and its abundance at Isabela was noted by Dr. M. D. Leonard (1932–127). Mr. John D. More vainly attempted control on the hedge of cannas

at the Union Club of Santurce during the summer of 1922. Control by DDT is now much simpler than when one was forced to use arsenate of lead, of poor adhesion to waxy canna leaves. For observing caterpillar internal anatomy these larvae are most useful, not only because of their almost perfect transparency but also because of their large size. The black-brown adults are possibly the largest Hesperiids in Puerto Rico, and may at once be distinguished by the whitish hyaline spots in the hindwing, three in number (two single and one double), as well as the much larger hyaline spots in the forewing.

Panoquina nyctelia (Latreille), identified for Mr. Thos. H. Jones as *Prenes ares* Felder by Dr. Harrison G. Dyar, is thus called in all the economic literature from the account in Jones and Wolcott (1922–41), illus-

Head and thorax of larva of *Panoquina nyctelia* (Latrielle), twice natural size. (Drawn by Thos. H. Jones.)

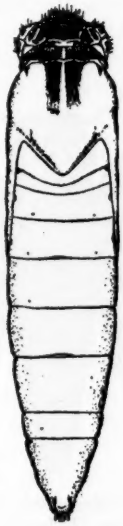
Front view of head of larva of *Panoquina nyctelia* (Latreille), twice natural size. (Drawn by Thos. H. Jones.)

trated by drawings of the front and side view of the head and chrysalis, almost to date. It is one of the more common Hesperiid caterpillars feeding on the leaves of sugar-cane in Puerto Rico. The adult may be most easily recognized by the largest of the white hyaline spots on the forewing being almost quadrangular, and the larva by the black collar on the dorsum of the neck.

Panoquina nero (Fabricius), of which Mr. Frank E. Watson described the local subspecies (1937–4) under the name of **belli**, was listed by Dr. Dewitz as a *Goniloba*, and by Herr Möschler and Dr. Gundlach as a *Hesperia*. Most unfortunately, the identification under this name by Dr. Harrison G. Dyar for the material collected by Messrs. D. L. Van Dine and Thos. H. Jones, referred to the next species, and all the economic notes under *nero*, including the drawings of larva, pupa and adult by Mr. Jones, are of *sylvicola*, a smaller but similarly marked species. The largest white hyaline spot on the forewing of *sylvicola* is shaped like a lop-sided arrowhead; that of *nero* has a very blunt point, but *nero* may most easily be recognized by the broad white transverse band on the underside of the hindwings, barely perceptible above. The Río Piedras collection contains one specimen collected by Mr. Thos. H. Jones on El Duque on March 9, 1914, which Dr. Wm. Schaus in 1923 had tentatively identified as "near *corrupta* H. S. of Cuba, appears peculiar to P. R. and is probably undescribed," and two others from Río Piedras, but Mr. Wm. P. Comstock

(1944–569) lists many other localities, including Adjuntas, Mayagüez and Ensenada, indicating island-wide distribution.

Panoquina sylvicola (Herrich-Schäffer), of which Mr. Frank E. Watson described the local subspecies (1937–6) under the name of **woodruffi**, was listed from Puerto Rico by Drs. Dewitz and Stahl as a *Goniloba*, and by Herr Möschler and Dr. Gundlach as a *Hesperia*. The larva is the most common Hesperiid caterpillar to be found attacking cane leaves, but in "The Seasonal Cycle of Insect Abundance in Puerto Rican Cane Fields"

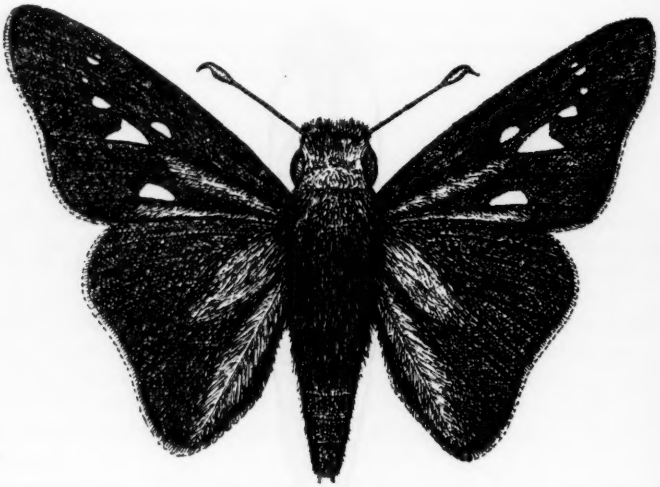


Pupa of *Panoquina nyctelia* (Latreille), twice natural size. (Drawn by Thos. H. Jones.)

(Jour. Agr. Univ. P. R., **27** (2): 95–104, fig. 12, ref. 16. Río Piedras, June 1944) its complete absence from April to September is recorded, due to total parasitizm by *Oöencyrtus prenidis* Gahan of the eggs. As *Prenes nero* Fabricius (due to original misidentification by Dr. Harrison G. Dyar) it is number 319 in Van Zwaluwenburg's list, and is repeatedly mentioned by Messrs. D. L. Van Dine, Thos. H. Jones and E. G. Smyth as a pest of sugar-cane, the most complete account appearing from the notes of and with the original illustrations by Mr. Jones (1922–39). From the larvae he reared the parasites which Mr. C. F. W. Muesbeck described as *Apanteles prenidis*, and also *Ardalus antillarum* Gahan, and noted direct attack by the

paper-nest wasp, *Polistes crinitus* Felton. Only *Trichogramma minutum* Riley was reared from the eggs by Mr. Jones during the years 1912 to 1914, altho recently the only egg-parasite was *Oöencyrtus*.

Panoquina ocola (Edwards) was reared in 1912–13 by Mr. Thos. H. Jones from larvae eating the leaves of sugar-cane and *Hymenachne amplexicaulis*, but he left no description of them. Apparently they were so similar to those of *P. sylvicola* as to be unrecognized as distinct until the adults appeared. Indeed, the adults also are quite similar, being somewhat smaller,



Adult of the common Sugar-Cane Hesperiid, *Panoquina sylvicola woodruffi* Watson, twice natural size. (Drawn by Thos. H. Jones.)

with smaller spots. They have repeatedly been intercepted from various points along the north coast, but there are no records of occurrence in xerophytic Puerto Rico.

Panoquina panoquinoides panoquinoides (Skinner) is the smallest of the genus in Puerto Rico, according to Mr. Wm. P. Comstock (1944–571), of which "the small, yellow hyaline spots of the forewing correspond in position with those of *ocola*, but they are frequently obsolete and sometimes absent."

Perichares phocion phocion (Fabricius), listed from Puerto Rico by Drs. Stahl and Dewitz as *Goniloba corydon* Fabricius, and by Herr Möschler and Dr. Gundlach as *Hesperia corydon*, the latter noting "la oruga se cría en varias gramíneas de hoja no pequeñas, pues se esconde entre ellas reunidas

con su seda como todas las orugas de esta familia," is a minor pest of sugar-cane, being number 308 on sugar-cane in Van Zwaluwenburg's list. "Conspicuous because of its size and hairiness, being entirely green with broad greenish-yellow dorsal stripe and long white hairs, caterpillars or pupae were found only from September to April, and only on the north coast: Coloso to Mameyes. One fully grown caterpillar, possibly attempting to pupate, was found being eaten by crazy ants, *Prenolepis longicornis* Latreille," during the five years 1936–1941 in which young cane was examined for egg-clusters of *Diatraea saccharalis*. In January 1922 caterpillars were noted on cane at Guánica, Arecibo and Toa Alta, possibly marking a period of exceptional abundance. Distribution is island-wide, Mr. R. G. Oakley having intercepted adults at Ponce. Typical adults have two larger amber hyaline spots in the forewing, and two small ones, which, in the males are inside the points of a crescent of grey scales.

Larva of the common Sugar-Cane Hesperiid, *Panoquina sylvicola woodruffi* Watson, twice natural size. (Drawn by Thos. H. Jones.)

HETEROCERA: Moths

Prof. Wm. T. M. Forbes of Cornell University has most recently treated the "Heterocera or Moths (excepting the Noctuidae, Geometridae and Pyralidae) Insects of Porto Rico and the Virgin Islands" (Scientific Survey of Porto Rico and the Virgin Islands, N. Y. Academy of Sciences, **12** (1): 1-171, pl. 2, ref. 52. New York, 1930). To this he added a "Supplementary Report on the Heterocera or Moths of Porto Rico" (Jour. Dept. Agr. P. R., **15** (4): 339–394, pl. 6. San Juan, November 1931) that is also reprinted as a supplementary part of Volume 12 of the Scientific Survey. His nomenclature and order of listing are followed in this account. To him the writer is most greatly indebted for a final reading of the MS as it was being printed. He rechecked all the locality records and added innumerable notes on nomenclatorial and other changes.

Euchromiidae (Syntomidae, Amatidae)

Phoenicoprocta parthenii (Fabricius), a clear-wing moth with red tegulae, was first listed from Puerto Rico by Dr. Dewitz as *Glaucopis multicincta* Walker, as a *Poecilosoma* by Herr Möschler and Dr. Gundlach. It was identified as a *Mallodeta* by Dr. Wm. Schaus: a specimen collected in 1912 at Río Piedras by Mr. Thos. H. Jones, and also by Dr. Harrison G. Dyar:

a specimen collected by Mr. E. G. Smyth at Hda. Santa Rita, Guánica. Prof. Forbes (1930–20 and 1931–341) lists collections at Aguadilla, Isabela and Coamo, and it has been intercepted at Bayamón.

Phoenicoprocta capistrana (Fabricius) has "tegulae solidly colored: yellow, or black and blue, not red." It was listed by all the earlier entomologists as *Glaucopis selecta* H. S., and in "Insectae Portoricensis" (1923 156) as a *Bombiliodes*, but the only recent collection is a specimen in the AMC collection: from Coamo.

Eunomia columbina (Fabricius), listed by the earlier entomologists as *Glaucopis insularis* Grote, was reared by Dr. Gundlach, who notes "la oruga en las convolvulaceas." Prof. Forbes (1930–22) lists a specimen from Maricao, which "leans a litle toward *rubripunctata*," and it is as **Eunomia rubripunctata** Butler that Mr. J. F. Gates Clarke identified the specimen which Dr. Luis F. Martorell collected at light on Mona Island.

Nyridela chalciope (Hübner), described as an *Isanthrene* from Habana, Cuba, was thus listed from Puerto Rico by Herr Möschler and Dr. Gundlach, the latter noting "la oruga se cría en la *Cupania americana*." Drs. Stahl and Dewitz use the generic name *Glaucopis*. Prof. Forbes (1931–341) lists specimens collected by Mr. Francisco Seín at Lares.

Cosmosoma auge (Linnaeus), originally described as a *Sphinx*, is the largest and most abundant of the clear-wing moths of Puerto Rico, brilliant with "abdomen blue dorsally, orange on sides," to quote from Prof. Forbes (1930–23). Drs. Dewitz and Stahl list it as *Glaucopis omphale* Hübner, and Herr Möschler and Dr. Gundlach use this specific name, the latter noting "la oruga se cría en la Mikania." It has been reared from a cocoon on a leaf of "cedro" (*Cedrela mexicana*) at Cayey, and adults have been collected at light from numerous points in the more humid parts of the Island, from the coast to El Yunque.

Cosmosoma achemon (Fabricius), var. **tyrrhene** Hübner, listed by Drs. Dewitz and Stahl as a *Glaucopsis*, according to Prof. Forbes has the "abdomen orange dorsally; blue on sides." Adults have been collected from numerous points in the more humid parts of the Island.

Lymire flavicollis (Dewitz), described (1877–94) as an *Echeta* from Puerto Rico, is a small greyish moth with plumose antennae, a yellowish collar, its wings entirely covered with scales. Drs. Dewitz and Stahl also list from Puerto Rico the Cuban *Echeta albipennis* H. S., and Dr. Wm. Schaus determined one unlabeled specimen from Puerto Rico as the Jamaican *Lymire melanocephala* Walker, listed in "Insectae Portoricensis" (1923–157). Prof. Wm. T. M. Forbes, in his "Notes on West Indian Syntomidae and Arctiidae (Lepidoptera)" (Bull. American Museum Nat. Hist., **37** (14): 339–345. New York, 1917), on page 345 redescribes the local species under the name of *Lymire senescens*, the type from Naguabo,

but later (1930–24) indicates its syononymy and the characters by which the other West Indian species may be recognized. Several adults have been collected at light on El Yunque, but others are from Mayagüez and Coamo, and one was reared from a cocoon intercepted on a cucumber leaf at Caguas.

Horama panthalon (Fabricius), originally described as a *Zygaena*, was listed from Puerto Rico by all the earlier entomologists, and at times may be exceedingly abundant. On January 9th, 1923, Mr. Francisco Seín collected in his hand eight adults at Boquerón, resting on leaves of "malvavisco" (*Waltheria americana*). They are narrow winged, brownish moths, with compactly plumose antennae, the abdomen banded with yellow, their prominent yellow-scaled hindlegs with distal third of tibia black. Altho Dr. Stuart T. Danforth had specimens from Tortuguero Lagoon, all other collections are from southwestern Puerto Rico: Añasco, Mayagüez, San Germán, Boquerón, Guayanilla, and Ponce to Aguirre and Guayama.

Horama pretus (Cramer), originally described as a *Sphinx*, was listed by all the earlier entomologists and is P. R. 151 in Van Zwaluwenburg's list. It has a wingspread of an inch and a half, its wings opaque with chocolate brown scales, its antennae with a black club and terminal yellow hook, yellow collar and metathorax, first segment of the abdomen mostly grey, the second laterally yellow, others above velvety brown. This strikingly beautiful moth has an equally brightly-colored larva, described in "Insectae Portoricensis" (1923–157) as "bright reddish-orange, reddest on thorax and head, shining, 15 mm. long, 7 mm. wide when fully grown; body with numerous spreading tufts of grey and white hairs, curved towards their tips; on the seven anterior abdominal segments dorsally are four compressed tufts of black hair in pairs, bending towards each other, the anterior pair of each segment closer together and touching at apex." They live in silken nests, webbing together leaves of "cocorrón" (*Elaeodendron xylocarpum*) and spinning cocoons of thin grey silk with longer hairs of the larva entangled in it, the pupa itself being a bright reddish brown in color. Larvae have been noted at Pt. Cangrejos, Manatí, Arecibo and Boquerón, and adults, altho sometimes attracted to lights at night, as at Río Piedras and Guánica, are more often noted on flowers in the daytime, as at Pt. Salinas, Boquerón and on Vieques Island.

Empyreuma pugione (Linnaeus), originally described as a *Sphinx* from St. Thomas, more nearly resembles a tarantula-hawk (*Pepsis rubra*) in color and general appearance, if not in habits and character. Listed from Puerto Rico by all the early entomologists, Dr. Gundlach notes "oruga en *Nerium*" and indeed oleander appears to be the only host of the larva. Listed as *E. lichas* Cramer by Mr. R. H. Van Zwaluwenburg under number

1634, he described (1916–45) the eggs as "round, yellow, brown before hatching, slightly iridescent, sculptured with dull sheen, regularly spaced in groups on under side of leaf. Larvae dull orange, hairy, with silvery lateral stripes. Larval stage 26 days, pupal stage 13 days. Adult has crimson wings and dark blue body." Locally, the hairy caterpillars may become a serious pest on individual oleander bushes, occurring in all the more humid parts of the Island. It has been definitely recorded from Mayagüez, Aguadilla, Isabela, Arecibo and Bayamón, with many records in the San Juan metropolitan area.

Correbidia terminalis (Walker), originally described as *Euchromia* (*Pionia*), was listed from Puerto Rico as *Charidea cimicoides* H. S. by all the earlier entomologists, Dr. Gundlach noting "la oruga vive en la cara inferior de las hojas de *Cecropia*, formando luego un capullo poco primoroso." This black and red banded moth is an inhabitant of the hurricane forest and the coffee groves, Prof. Forbes reporting recent collections on El Yunque and at Lares, and additional specimens have been taken at light on El Yunque and at El Verde subsequently.

Correbidia bicolor (Herrich-Schäffer), listed from Puerto Rico by Herr Möschler and Dr. Gundlach as a *Charidea*, is considered by Prof. Forbes (1930–27) as "possibly an extreme light form of the preceeding, from which it appears to differ only in color," being mostly orange.

Nolidae

Celama sorghiella (Riley), originally described as a *Nola*, was re-described from Puerto Rico by Herr H. B. Möschler (1889–118) as *Nola portoricensis*. It is a minute whitish moth with some pale brown and blackish scaling, occurring, according to Prof. Forbes (1930–28), in the southern United States to northern South America, Argentine, rare or absent in tropical South America. As the caterpillars feed on the arrows of sugar-cane, this peculiar distribution, paralleling that of the culture of sugar-cane, is quite obvious. The small hairy, yellowish caterpillars, with pink lateral stripes and dark yellow heads are at times enormously abundant in sugar-cane arrows, and may even eat the pupae of those developing most rapidly. Dr. Wm. Schaus identified the reared adults, as well as numerous others intercepted at light at Bayamón.

Nola bistriga, described by Herr H. B. Möschler (1890–119) as a *Stenola* from Puerto Rico, is re-described by Prof. Forbes (1930–29) from a female from El Yunque as having a wingspread of 20 mm., "white, lightly sprinkled with black, with two nearly straight and parallel black lines across the wing." Mr. Francisco Seín found an additional female at Lares.

Nola sinuata is described by Prof. Wm. T. M. Forbes (1930–29), the types

all females from Coamo, "expanse 16 mm., forewing dull white, lightly dusted with fuscous and some blackish scales."

Arctiidae: Woolly Bears

Lycomorphodes strigosa (Butler), originally described as a *Trichromia*, was re-described from Puerto Rican material by Herr Möschler (1890–114) under the name of *Lycomorpha fumata*. It has not since been found in Puerto Rico.

Progona pallida was described as a *Delphyre* from Puerto Rican material by Herr H. B. Möschler (1890–118): a grey moth with black costal margin. It is quite common according to Prof. Forbes (1931–342), who lists collections at San Germán, Lares, Dorado, Cayey and on El Yunque. Numerous specimens were intercepted at light at Bayamón, Dr. W. A. Hoffman found it as El Semil, and Don Julio García-Díaz (1938–96) lists it, presumably collected on El Yunque.

Agylla sericea (Druce) was re-described by Herr Möschler (1890–117) from a single Puerto Rican specimen under the name of *Gnophria limpida*. It has not since been found locally.

Paramulona albulata (Herrich-Schäffer), originally described as a *Mieza*, and thus listed from Puerto Rico by Drs. Stahl and Dewitz, has not since been found locally.

Mulona nigripuncta Hampson, is "whitish with some fifteen black dots and an orange dot near end of cell," according to Prof. Forbes (1930–33), the type having been from Colombia. Herr Möschler and Dr. Gundlach presumably had specimens, listed as *Cincia conspersa* Walker. Prof. Forbes (1931–342) notes collections at San Germán, Palmas Abajo and Lares. Repeated interceptions have been made at light at Bayamón, and at San Juan.

Afrida charientisma Dyar, listed by Herr Möschler, Dr. Gundlach and in "Insectae Portoricensis" (1923–158) as *Afrida tortriciformis* Möschler, is reported from El Yunque by Prof. Forbes (1930–34). It has been repeatedly intercepted at light at Bayamón, and was collected by Dr. W. A. Hoffman at El Semil, and by Mr. Francisco Seín at Lares.

Eupseudosoma floridum Grote was listed from Puerto Rico by all the early entomologists as *E. nivea* H. S., Dr. Gundlach noting "la oruga en *Psidium*." Several of the beautiful brown hairy caterpillars with yellow heads were found feeding on leaves of guava at Río Piedras in April 1921, and reared to the satiny white adults, their abdomens, and in the males the inner margin of the hind wings, being suffused with pink. Dr. Richard T. Cotton had found larvae on guava at Caguas and reared adults in 1916, and Prof. Forbes (1930–34) also lists *Eugenia* as a host plant for the larva and records collections at Lares and Mayagüez.

Ammalo insulata (Walker), originally described as a *Halesidota*, was listed from Puerto Rico by all the early entomologists as *Pareuchaetes cadaverosa* Cramer and *P. affinis* Grote, not in synonymy, Dr. Gundlach noting "la oruga vive en *Vernonia*, *Eupatorium*." It is an entirely pale yellowish moth, except for a line of black spots on the dorsum of the abdomen, found in all parts of the Island from Guánica to Aibonito, Bayamón and Pt. Cangrejos, and collected by Dr. Luis F. Martorell at light on Mona Island. Prof. Forbes now calls it **Tanada insulata** (Walker).

Phegoptera bimaculata was described by Dr. Hermann Dewitz (1877–95) as a *Halisidota* from a single specimen from Puerto Rico, of which no subsequent specimen has been found locally.

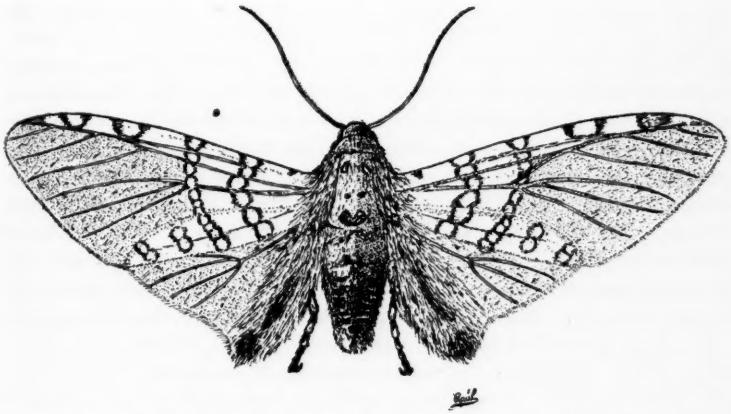
Microdota hemiceras was described by Prof. Wm. T. M. Forbes (1931–343), the type from San Germán, another from Coamo: a clay-colored moth, translucent, dusted with fuscous, with a wing expanse of 16 mm.

Halysidota cinctipes Grote was first recorded from Puerto Rico by Dr. Dewitz, and as *Halisidota tesselaris* Hübner listed by Herr Möschler, Dr. Gundlach noting "la oruga vive probablemente en Hibiscus." Prof. Forbes (1930–36) after describing the black and red-brown caterpillar, "clothed with gray-brown general hair and largely white pencils," states that "it eats *Coccoloba*." An adult was collected by Mr. Francisco Seín at Lares in December 1930, and another in July 1931.

Calidota strigosa (Walker), originally described as a *Sychesia*, was listed from Puerto Rico as a *Halisidota* by all the earlier entomologists. It is a large moth, thorax and forewings whitish striped with brownish-black, its abdomen light pink above, laterally spotted with black, not common in Puerto Rico, but found in abundance on Mona Island. According to Prof. Forbes (1930–37) its range includes the Greater Antilles and southern United States; "caterpillar on *Guettarda elliptica*; red-brown with shining black head."

Ecpantheria icasia icasia (Cramer), originally described as a *Bombyx*, was listed from Puerto Rico by all the earlier entomologists, who also gave the name *E. eridane* Cramer, not in synonymy. In Van Zwaluwenburg's list this was *E. eridanus* Cramer, number 1630, reared from *Erythrina micropteryx*, *Ipomea* sp, orange and banana, with the note "synonym of *E. icasia*: reared from the same egg-cluster and mated." In his "Notes on the Life History of *Ecpantheria eridanus* Cramer" (Insecutor Inscitiae Menstruus, **4** (1–3): 12–17. Washington, D. C., January–March 1916), Mr. R. H. Van Zwaluwenburg gave an extended account of this common woolly bear caterpillar which he found attacking also vanilla and *Cissus sicyoides*, describing all stages and noting *Eremotylus angulatus* Hooker as a parasite of the larva. In subsequent reports of the Mayagüez Station (1938–93, 1940–25 and 1943–29), it has repeatedly been noted as a pest on

vanilla. Dr. Richard T. Cotton (1918–285) records the attack of the caterpillars on stalks of celery, but actually they are almost omnivorous feeders in the garden, having been noted on beans, lima beans, tomato and eggplant, as well as on *Solanum torvum* and other weeds. The red-headed, black caterpillar, covered with stiff black hair, may be eaten with impunity by the crested lizard, *Anolis cristatellus*, and apparently relished, for three have been found devoured by the same lizard. Egg-clusters have been noted on *Psidium guajava* and *Cederela mexicana*, from one of which hatched 2,450 caterpillars. The adult is a large whitish moth with diagonal rows of brownish rings on the forewings, of which collections have been made in all parts of the Island, from El Yunque and Jájome Alto to Guánica and Isabela.



Adult of the Woolly Bear Caterpillar, *Ecpantheria icasia icasia* (Cramer), twice natural size. (Drawn by Raúl Maldonado.)

Utetheisa ornatrix ornatrix (Linnaeus) and **U. o. stretchii** (Butler) represent in Puerto Rico merely two color phases of the same species, of which the typical form has pale pink forewings with but a few scarlet dots only, while *stretchii* has forewings mostly cochineal pink, with prominent black spots. Listed from Puerto Rico by Dr. Dewitz as a *Deiopeia*, by Dr. Stahl as a *Callimorpha*, Dr. Gundlach gives all these names and *Utetheisa bella* Linn., noting "el colorido varía muchísimo, y por esto existen dos nombres. Muy común en los campos, la oruga se cría en *Crotalaria*." The scantily hairy, black and yellow banded caterpillars feed primarily inside the ripening pods of *Crotalaria*, and but rarely on the foliage, preferring the smooth pods of *retusa* to the hairy ones of *incana*. They void their excrement

outside the pods, and normally eat all the green seeds in a pod, leaving it clean and empty, with only the round hole for entrance and exit. They are often sufficiently abundant to cause appreciable losses when *Crotalaria* is being grown for seed production, but are of negligible importance when it is only for a cover crop or for green manure, and there is no record of an attempt being made at chemical control. The beautiful but rather weak-flying and helpless moths have been found in all parts of the Island and have an extensive neotropical distribution, a discussion of their races and variations being given by Prof. Forbes (1930–39 and 1931–343).

Pericopidae (Hypsidae in part)

Composia sybaris (Cramer), originally described as a *Phalaena*, was listed from Puerto Rico by all the earlier entomologists, Dr. Gundlach noting occurrence also in Jamaica, Santo Domingo and St. Croix. The record of *Composia fidelissima* H. S., as determined by Dr. Wm. Schaus, in "Insectae Portoricensis" (1923–179), refers to this species: a specimen captured by Mr. D. L. Van Dine at light in Arecibo. Altho the adults may come to light, they are day-flying moths, several having been noted flying in the bright sunlight in a coconut grove at Mameyes in November 1922, and feeding at flowers of "cariaquillo" (*Lantana camara*). Prof. J. A. Ramos reports (1947–44) them on "the flowers of *Pisonia albida* at Uvero Beach, April 4–7, 1944" on Mona Island, Dr. Luis F. Martorell having previously collected them at light on Sardinera Beach. Indeed they normally have the habits and appearance of a butterfly; black winged with white spots, a few bright red ones near the anal margin, the black abdomen also being spotted with white. Dr. Harrison G. Dyar has described the pale yellow caterpillars as having blue-black transverse stripes on abdominal segments 1–7, red stripes on thorax and eighth and ninth segments of abdomen; head red, as are also legs and anal plate; black hair, with four long white hairs on mesothorax and eighth segment of abdomen.

Ctenuchidia virgo Herrich-Schäffer, of which Prof. Wm. T. M. Forbes described the local race under the name of **virginalis** (1930–42), the type from Maricao, others from Indiera, is a black moth with plumose antennae, marked with orange on abdomen and at base of forewings, spotted with white; the hindwings extensively suffused with blue or blue-green iridescence. This was identified by Dr. Harrison G. Dyar as *Composia subcyanea* Walker, as listed in "Insectae Portoricensis" (1923–179): an adult found resting on grass and weeds in an abandoned coffee grove at Indiera, in the mountains north of Yauco. Mr. Jorge Serralés in May 1941 collected one on El Yunque at light, indicating island-wide distribution in the higher mountains.

Hyalurga (or **Lauron**) **vinosa** (Drury) was listed from Puerto Rico by

all the early entomologists, Dr. Gundlach noting "la oruga en *Tournefortia* y *Heliotropium*." In "Some Notes on the Habits and Life History of *Lauron vinosa* Drury" (Insecutor Inscitiae Menstruus, **2** (7): 108–11. Washington, D. C., 1914) Mr. Thos. H. Jones described all stages, reared by him at Río Piedras, and his record is in Van Zwaluwenburg's list as P. R. 123: on *Heliotropium indicum*. The caterpillars have also been intercepted at Bayamón on "cotorillo" (*Schobera angiosperma*), and indeed the dark fluttery adults may be expected wherever any Borraginaceus host plant grows. Most of the hind wing is semi-transparent, as is the base of the forewing, which is surrounded by a triangle of dull orange, with a prominent transverse white band across the apex. Prof. Forbes (1930–42) records collection by Mr. Aug. Busck on Culebra Island, and adults have been intercepted by Mr. R. G. Oakley at Ponce.

Agaristidae (Phalaenoididae)

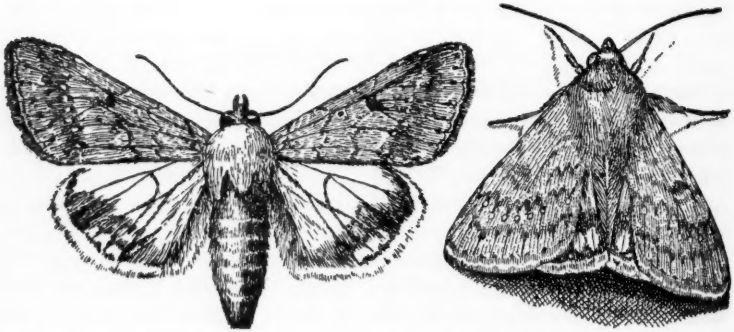
Tuerta sabulosa (Boisduval) was re-described from Puerto Rican material by Herr H. B. Möschler (1890–112) under the name of *Agarista noctuiformis*, and as a *Tuerta*, determined by Dr. Wm. Schaus, was listed in "Insectae Portoricensis" (1923–160). Prof. Forbes (1930–43 and 1931–344) records collections at Guánica, San Germán and Coamo of this moth which also occurs from New Mexico to Central America. Adults collected at light in the Guánica Insular Forest in August 1941 by Mr. Norberto Lugo were identified by Mr. Hahn W. Capps as **Misa sabulosa** (Boisduval), and presumably this is the preferred name at present. The light-colored fore wings are speckled and barred with scales of brown; the base of the hind wing is light yellow, the broad, sharply defined margin, dark brown; total wingspread 36 mm.

Noctuidae: Millers, Cutworms or Armyworms

Dr. William Schaus in writing the "Moths of the Family Noctuidae" (Scientific Survey of Porto Rico and the Virgin Islands, **12** (2): 175–290. New York, June 7, 1940) has provided a most modern systematic outline which will be followed in presenting the biologic notes on the members of this family, many of which are of major economic importance.

The American **Heliothis obsoleta** (Fabricius): the corn earworm, the tomato fruitworm and the cotton bollworm of the United States, in the latest list of "Common Names of Insects Approved by the American Association of Economic Entomologists" (November 14, 1946) is called **Heliothis armigera** (Hübner), of which it is an original homonym. It was thus listed from Puerto Rico by the early entomologists, Dr. Gundlach noting "en las mazorcas del maís y en las cápsulas del algodón." Using one name or the other it has been noted or discussed at length by every

subsequent economic entomologist as a serious pest of corn, and a minor pest of beans, peppers, tomatoes, tobacco buds and seed pods, eggplant, peas, pigeon peas, and most recently attacking sunflower heads. Noted by Mr. L. Courtney Fife (1939–6) as not attacking cotton locally, caterpillars were abundant feeding within bolls at Isabela in 1950: the first record on this host since that of Dr. Gundlach. Even as a pest of the ears of corn its occurrence can by no means always be anticipated. But in the growing of sweet corn at the Mayagüez Station it proved to be a major pest, in the control of which Mr. B. A. App in "A Report on some Investigations of Corn Insects in Puerto Rico" (Jour. Agr. Univ. P. R., **25** (4): 21–31. Río Piedras, April 7, 1942) used hog rings, paper caps, string and wires. In



Adult of the Corn Earworm, *Heliothis obsoleta* (Fabricius), twice natural size. (After Quaintance, U. S. D. A.)

the next few years, however, the use of pyrethrum extract in mineral oil proved to be such an outstanding success in the United States as entirely to displace such make-shift remedies. Against attack by these viciously-biting caterpillars on other vegetables no such obvious remedy is available. Most of the larvae noted in Puerto Rico are bright yellow, marked with dark brown and black, the adults showing little variation from the standard pattern of light yellowish-brown forewings, the hindwing deeply margined with dark brown. Of its economic status, Dr. Schaus (1940–180) merely notes: "larva on corn, tobacco buds, tomatoes, etc."

Heliothis (or **Chloridea**) **virescens** (Fabricius) is not listed by Drs. Stahl and Dewitz from Puerto Rico, but Dr. Gundlach states "la oruga es muy dañina, principalmente al tabaco, pues vive en el cogollo y luego también en las cápsulas. Lo mismo en las cápsulas de *Hibiscus*, *Sesamum* y otras plantas. Una oruga que llevaba en la mano me mordía puesta con otras orugas se las comía." There is no record of attack on tobacco since

that of Dr. Gundlach, but Mr. John D. More did rear this greenish moth from cotton at Sabana Llana in 1922, and Mr. L. Courtney Fife (1939–6) records finding the larvae abundant on *Abutilon hirtum* at Guánica, Lajas and Boquerón in November 1935. It is mainly a pest on pigeon peas, however, being in Van Zwaluwenburg's list as number 1627: on *Cajan cajan*, and thus noted or discussed by Messrs. Richard Faxon & C. P. Trotter (1932–446), by Dr. Mortimer D. Leonard (with A. S. Mills 1931–473, 1932–136 and 1933–122) and finally by the latter (1931–119) as eating cowpea pods. Up to 1935, thirty interception records of finding these caterpillars in pigeon peas had been made: at Isabela, Aguadilla, San Sebastián, Las Marías, San Germán, Ensenada, Peñuelas, Ponce, Juana Díaz and Aguas Buenas.

Agrotis malefida (Guenée), listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Argotis submucosa* H. S., is listed by Dr. Schaus (1940–180) as having been collected on Vieques Island, and at Ensenada and San Germán, the "larva a general feeder."

Agrotis subterranea (Fabricius) was listed from Puerto Rico by the early entomologists as *Argotis annexa* Treitschke, Dr. Gundlach noting "La oruga vive durante el día al pie de plantas tiernas, y sale al oscurecer para comer el tronco tierno. Causa daño en las huertas." This dirty brown cutworm, commonly known as "cachazudo" in Cuba, and "cuerudo" in Puerto Rico, is a serious pest of tobacco, and of it an extensive account is given in "Los gusanos de la Hoja del Tabaco" (Circular No. 53, Est. Expt. Insular, Río Piedras, pp. 1–15, fig. 8, pl. 1. San Juan, October 1922), and in "An Economic Entomology of the West Indies," pages 554 to 557, under the name of *Feltia annexa*.

In large part because of its ready availability, this cutworm was used in experiments "On the Amount of Food Eaten by Insects" (Jour. Dept. Agr. P. R., **9** (1): 47–58, ref. 6. San Juan, 1925), which indicated that tobacco leaves are 60% digestible by the larva, and that one eats "3.746 gr. of fresh tobacco leaves (or .5244 gr. dry), or 8.2 times as much as the weight of the adult." Altho normally a pest of tobacco in Puerto Rico, the caterpillars may attack other crops, as alfalfa at Fajardo in 1913, of which the adult was determined by Dr. Harrison G. Dyar, and cucumbers at Río Piedras in 1937. The year 1937 also marked an epidemic outbreak of these caterpillars at Boquerón where they destroyed three successive plantings of cotton, as related by Mr. L. Courtney Fife (1939–6). Moths have been collected at light at many points of Puerto Rico, not only in the tobacco regions of the mountains but also at Ponce and Guánica, and by Dr. Luis F. Martorell and Prof. J. A. Ramos (1947–45) on Mona Island. They are but little more attractive in appearance than the cater-

pillars, the forewings being a faded purplish-brown, with a lighter submarginal band and along the basal two-thirds of the costa.

Agrotis apicalis Herrich-Schäffer was listed from Puerto Rico by Herr Möschler and Dr. Gundlach, but has not since been collected locally.

Argotis repleta Walker, as determined by Dr. Harrison G. Dyar, was reared by Mr. Thos. H. Jones in February 1912 from a "larva found under clod of dirt in section where *Laphygma* and *Remigia* were abundant" feeding on young cane leaves at Río Piedras.

Anicla infecta (Ochsenheimer) was listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Agrotis incivis* Guenée, and appears on Van Zwaluwenburg's list as number 1509: on millet, grass, seed cane. Mr. E. G. Smyth collected a dozen adults at light at Hda. Santa Rita in 1913, as determined by Dr. Harrison G. Dyar, and they have been repeatedly intercepted at light at Bayamón. They are light purplish-grey above, speckled with black scales, with a fat c-shaped mark towards the center of the forewing. The small caterpillars found attacking very young cane leaves in the greenhouse at Río Piedras were green except for a broad chalky white stripe along the side of the body just above the legs, but older ones tended to be brownish or yellowish; the chalky white stripe becoming light orange in color, margined with light yellow. In the brown caterpillars this continuous stripe from head to anus, just below the spiracles, is entirely yellow or yellow brown, with sometimes two or more small black marks just beneath most of the spiracles. The fully-grown larvae pupated on the surface of the soil, making little attempt at forming a cocoon. Dr. Schaus (1940–182) notes the occurrence of this species "throughout tropical America."

Tiracola plagiata (Walker) was listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Agrotis grandirena* H. S., but has not since been found locally.

Lacinipolia parvula (Herrich-Schäffer) was listed as a *Mamestra* from Puerto Rico by the early entomologists, Herr Moschler (1880–135) noting "Raupe an *Solanum torvum*." During the summer of 1916, Mr. Eugene G. Smyth repeatedly reared this from larvae on *Solanum torvum*, and collected adults at light at Río Piedras and Isabela. Dr. Schaus (1940–183) lists collections from Mameyes and Coamo. The moth is rather small for a Noctuid, the forewings gray-brown transversely banded with dark brown.

Eriopyga adjuntas was described by Dr. Wm. Schaus (1940–184) from a single male from Adjuntas, with a wing expanse of 24 mm., its forewings mostly "buffy brown."

Xanthopastis timais (Cramer), form **antillium** Dyar, was listed from Puerto Rico by all the early entomologists, Dr. Gundlach "la oruga se alimenta de las hojas y cebollas de amarillideas." It is number 1684 in

Van Zwaluwenburg's list: on *Hibiscus rosa-sinensis* and *Xanthosoma*. The caterpillars are often a serious pest on the leaves of the white spider amaryllis or "lirio" (*Hymenocallis declinata*) of the beaches of the north coast, on the red amaryllis or "amapola" (*Hippeastrum puniceum*) of the fields, in gardens attacking duendes and other cultivated kinds of amaryllis, as well as tuberoses at times, being gregarious and often entirely destroying all aerial portions of the plants. The adults, often attracted to light, have hairy, dark brown thorax, wings mostly lavender in color, with brown areas and spots, and smaller spots or points of yellow. The larvae have bright yellow heads, dark purplish bodies with yellow spots, soft and watery. They are rapidly and very effectively controlled with DDT dust, applied directly to the caterpillars themselves.

Leucania chejela (Schaus), originally described from Guatemala, is listed by Dr. Schaus (1940–185) from Cuba, Jamaica and Puerto Rico.

Leucania hampsoni is the new name proposed by Dr. Wm. Schaus (1940–185) for what Herr Möschler and Dr. Gundlach listed from Puerto Rico as *Leucania clarescens* Hampson: a Cuban species not found locally. Specimens in the American Museum of Natural History were collected at Coamo Springs. For this and the other species of *Leucania* Dr. Schaus uses the generic name *Cirphis*, and this is the name most often used in the economic literature, especially for the sugar-cane feeding species: *latiuscula*.

Leucania humidicola (Guenée) was listed by Dr. Wm. Schaus (1940–186) from Coamo, and identified by Mr. J. F. Gates Clarke for Dr. W. A. Hoffman: specimens collected at light at El Semil, Villalba.

Leucania jaliscana (Schaus), originally described from Mexico, Central and northern South America, is listed by Dr. Schaus (1940–185) from Cuba, and from San Juan, Cataño, Toa Baja, and Guánica in Puerto Rico.

Leucania latiuscula (Herrich-Schäffer), listed from Puerto Rico by the early entomologists as a *Leucania*, and in addition re-described by Herr Möschler (1890–141) from local material as *Leucania punctifera* and *Leucania senescens*, is a minor pest, in Van Zwaluwenburg's list number 2010, on sugar-cane and grasses. It is listed or discussed by Mr. D. L. Van Dine (1913–257, 1913–33), by Mr. Thos. H. Jones (1914–462), and by Mr. E. G. Smyth (1819–144), but the most extensive account as a pest of sugar-cane is in Jones and Wolcott (1922–43). It is parasitized by a Tachinid, *Compsilura oppugnator* Walton, the Braconid, *Apanteles marginiventris* Cresson and a species of *Euplectrus*. Mr. R. A. Vickery in his "Observations on *Cirphis latiuscula* H. Sch. in the Gulf Coast Region of Texas" (Jour. Agr. Research, **32** (12): 1099–1119, fig. 3, ref. 14. Washington, D. C., June 15, 1936), under "Economic History" on page 1100, gives a summary of the Puerto Rican records up to that time. It would appear that the larvae were much more abundant on sugar-cane in 1911 to 1913 than at any later period, for they were collected in large numbers in all the coastal, sugar-

cane growing regions of the Island during those years, and many adults noted at light, at Río Piedras, and at Guánica. In recent years adults have twice been intercepted at light at Bayamón, but were not noted in a five year (1936–41) survey of the cane fields of the Island, Dr. Schaus (1940–186) citing only collection by Prof. Forbes in 1939 from Vieques Island. The caterpillars vary considerably in ground color from pinkish and yellowish to light grey-brown; and are surprisingly similar in color, granulation and texture of skin to dying or dead cane leaves, altho they live and feed on normal, healthy green leaves. The adults are yellowish, creamy moths, their forewings finely and lightly striped with darker scales and a submarginal row of small darker spots.

Leucania inconspicua (Herrich-Schäffer) was listed from Puerto Rico by the earlier entomologists and as a *Cirphis* Dr. Schaus (1940–187) lists more recent collections from Cataño, Toa Baja, Coamo and Adjuntas.

Leucania microsticha Hampson, listed by Drs. Stahl and Gundlach as *Leucania secta* H. S., and by Herr Möschler (1880–141) as *Leucania commoides* Guenée: "Raupe auf gräsern," was listed by Dr. Schaus (1940–186) from Toa Baja, and has been intercepted at light at Bayamón, as identified by him.

Leucania phragmitidicola (Guenée), listed from Puerto Rico by Herr Möschler and Dr. Gundlach, is identified by Dr. Schaus (1940–187) from Coamo and Guayama, as a *Cirphis*.

Leucania unipuncta (Haworth), the common armyworm of temperate zones, was listed from Puerto Rico by the early entomologists as *Leucania extranea* Guenée. Mr. Thos. H. Jones reared it to adult from larva on grass in the winter of 1912, and the following summer Mr. E. G. Smyth collected six adults at light at Hda. Santa Rita, Guánica, all identifications by Dr. Harrison G. Dyar, but it has not since been found locally.

Meliana rosea (Möschler) is identified by Dr. Wm. Schaus (1940–187) from Ensenada and Coamo.

Magusa orbifera (Walker), listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Laphygma angustipennis* Möschler, is identified by Dr. Schaus (1940–188) from Cataño, and at Ensenada "both normal form and ab. *divida*."

Speocropia scriptura (Walker), re-described from Puerto Rico by Herr H. B. Möschler (1890–131) under the name of *Polyphaenis nona*, has not since been found locally according to Dr. Schaus (1940–188).

Cropia infusa (Walker), listed from Puerto Rico as *Decalea infusa* Walker by Herr Möschler and Dr. Gundlach, has not since been found locally, according to Dr. Schaus (1940–189).

Perigea albigera Guenée, listed from Puerto Rico by Herr Möschler and Dr. Gundlach, has recently been collected at Coamo, Aibonito and Ensenada, according to Dr. Schaus (1940–190).

Perigea apameoides Guenée, listed from Puerto Rico by the early entomologists as *Perigea subaurea* Guenée, was collected at light at Hda. Santa Rita, Guánica, by Mr. E. G. Smyth, and repeatedly intercepted at light at Bayamón. Dr. Schaus (1940–190) lists collections at seven Puerto Rican localities, and on St. Thomas, and occurrence from the United States to Argentina. The adult has a white spot in the middle of the variegated bronzy-brown forewing.

Perigea concisa (Walker), as identified by Mr. Frank E. Watson for moths collected by Mr. E. G. Smyth at light at Hda. Santa Rita, Guánica, has since been repeatedly intercepted at light at Bayamón, and Dr. Schaus (1940–191) records the attack of caterpillars on cotton at Mayagüez, as well as collection of adults at Coamo and Arecibo.

Perigea circuita Guenée was listed by the early entomologists from Puerto Rico, and unlabeled specimens have since been determined from there.

Perigea cupentia (Cramer) was listed from Puerto Rico by Dr. Stahl as *P. infelix* Guenée, and by Dr. Gundlach and Herr Möschler as a *Craniophora*. Mr. E. G. Smyth reared the caterpillars, "green mottled with cinnamon brown," from "salvia" (*Pluchea purpurascens*) in the summer of 1916 at Río Piedras, as did also Mr. Francisco Seín in 1923, and Mr. A. S. Mills at Pt. Cangrejos. The adults have dark hindwings, and forewings of "cinammon brown" mottled with mauve, and have been taken at light at Río Piedras and intercepted at Bayamón. Dr. Schaus (1940–189) lists collections at Lares and Aibonito. An exceptionally light-colored specimen found dead on the window ledge of the laboratory at Río Piedras in March 1945, identified by Mr. Carl Heinrich as *Condica cupentia* (Cramer), is quite different. Prof. Forbes notes that Mr. J. G. Franclemont considers that two species are combined under this name. He labels *cupentia* the bluish one with strongly mottled wings: material from St. Thomas; he calls the Puerto Rican species with a large area of nearly smooth cream or clay color *epopea* Cramer.

Perigea selenosa Guenée, listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *P. stelligera* Guenée, is identified by Dr. Schaus (1940–191) from San Germán, noting that it "has the white discal spot large."

Perigea sutor Guenée, as identified by Mr. Frank E. Watson for Mr. E. G. Smyth: moths which he had reared during the summer of 1916 from green caterpillars feeding on "salvia" (*Pluchea purpurascens*) at Río Piedras, was subsequently intercepted at light at San Juan and Bayamón, and Dr. Schaus (1940–191) lists collections at Naguabo, Coamo and Ensenada. These moths have almost no markings on their plain brown forewings.

Perigea punctirena (Walker), listed as a *Hadena* from Puerto Rico by Herr Möschler and Dr. Gundlach, has not since been found locally.

Cobaliodes tripunctus Hübner was listed by Dr. Dewitz (1877-243) from Puerto Rico.

Eriopus floridensis Guenée, as determined by Dr. Schaus, was reared in the summer of 1922 from a fern at Río Piedras; a light green caterpillar when small, striped with lighter green, but in the last instar dark brown, with stripes of light yellow on either side of the back. It was first listed from Puerto Rico as *Eriopus elegantulus* H. S. by Herr Möschler, Dr. Gundlach noting "criado en *Aspidium*." Adults have since been intercepted at light at Bayamón. Dr. Schaus (1940–192) notes that it occurs in Florida and tropical America, and (in correspondence) that it "sometimes attacks ferns in greenhouses." Prof. Forbes adds that it actually straggles as far north as Binghamton, New York.

Eriopus jamaicensis Möschler, listed from Puerto Rico by Herr Möschler and Dr. Gundlach, is identified by Dr. Schaus (1940–192) from Lares.

Agripodes jucundella, as one of "New American Moths and Notes," was described by Dr. Harrison G. Dyar, the type from Indiera, Puerto Rico (Insecutor Inscitiae Menstruus, **10** (10): 8–18. Washington, D. C., 1922), reared by Mr. Francisco Seín from a grey-green and dark brown caterpillar feeding on lichens of trees in the hurricane rain forest. It formed a thin, tough cocoon in the lichen, and the emerging moth has forewings light green, marked with black and white, the hind wings grey. Dr. Schaus (1940–193) lists collection of adults at Aibonito.

Cephalospargeta elongata was described by Herr H. B. Möschler (1890–120) from Puerto Rican material collected by Dr. Gundlach and listed by him. Dr. Schaus (1940–193) records one recent collection from Guánica.

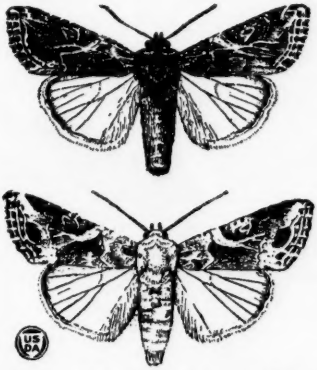
Metaponpneumata rogenhoferi was described by Herr Heinrich B. Möschler (1890–159), the type from Puerto Rico. Some small gray-brown moths collected by Mr. E. G. Smyth at Hacienda Santa Rita, Guánica in the summer of 1913, identified by Dr. Harrison G. Dyar as *Prorachia* (*Eumestleta*) *daria* Druce, are this species. Dr. Schaus (1940–194) lists collections from Coamo and Guayama, and Prof. Forbes from Aguirre.

Catabena esula (Druce) is identified by Dr. Wm. Schaus (1940–194) from Coamo, Guánica and San Germán. Mr. J. F. Gates Clarke identified for Dr. Luis F. Martorell these practically unmarked grey moths, their clear hindwings margined with brown, which he found in abundance at light on Mona Island, at the lighthouse and at Sardinera Beach. Prof. J. A. Ramos (1947–45) also found them abundant on Mona.

Catabena vitrina (Walker), listed as *Callierges divisa* H. S. from Puerto Rico by Herr Möschler and Dr. Gundlach, has recently been collected at both Guánica and Aguirre according to Dr. Schaus (1940–194). Extending straight across its grey fore wings from base to the middle of the margin is a narrow black stripe, paralleled near the margin by short stripes.

Prodenia androgea (Cramer) was listed from Puerto Rico by the early entomologists, Dr. Gundlach noting "la oruga vive durante el día al pie de una planta tierna y de noche sale de la tierra a comer. Hace mucho daño en las huertas y otras tierras cultivadas, pues troncha los renuevos. Come de muy diferentes plantas." Dr. Schaus (1940–196) questions the correctness of this identification, altho "in the U. S. National Museum (is) a female from an old Porto Rican collection . . . , also a specimen from Cuba."

Prodenia dolichos (Fabricius), listed from Puerto Rico as *P. commelina* Smith and Abbot by Herr Möschler and Dr. Gundlach, is identified by Dr. Schaus (1940–195) from Coamo and Ensenada, and Prof. Forbes collected it on Vieques.

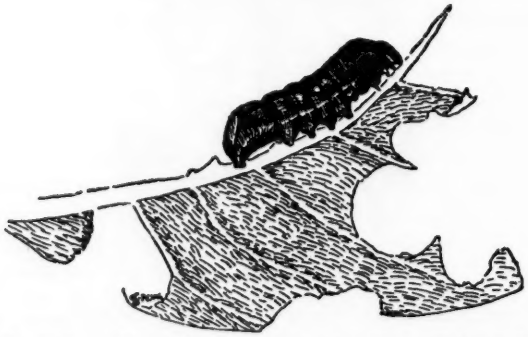


Dark and light forms of the adult of *Prodenia ornithogalli* Guenée, twice natural size. (After Chittenden.)

Prodenia latifascia Walker, listed as *P. testaceoides* Guenée by the earlier entomologists, is in Van Zwaluwenburg's list as number 912 on tomato. A cutworm attacking tobacco at Caguas in May 1921 was reared to adult, determined as this species by Dr. Wm. Schaus, and based on this instance are the records of it as a pest of tobacco. Another individual, which ate nearly twice as great a weight of tobacco leaves (6.697 gr.) as the common "cuerudo" (*Feltia subterranea*) in attaining full size, died in pupating. The adults have pinkish-purple, semitransparent hind wings, and a complicated pattern in the male of yellowish-brown on the forewings, with a large oval lighter area near the center towards the costal margin. Prof. Forbes points out that "the female is dull brown mixed with whitish, with very little yellow at inner margin, or none."

Prodenia ornithogalli Guenée, listed as *P. eudiopta* Guenée from Puerto Rico by Herr Möschler and Dr. Gundlach, was noted by Mr. Thos. H.

Jones (1915–8) as having been reared by him "from larvae found feeding on a weed of the family Convolvulaceae." Mr. E. G. Smyth collected eight adults at light, as identified by Mr. Frank E. Watson, during the summer of 1913, finding them "rather rare at light but a common species in the garden." This black cutworm, marked with golden triangles and a lateral band of yellow, preferably feeds on tobacco leaves, usually from the lower side, but has been noted on the upper side in full sunshine. Cuban tobacco growers call it "matequilla," but locally in Puerto Rico it is "casimir." It has also been noted feeding on the fruits of eggplant, tomato and pepper, and in 1942 and 1944 was observed on cowpeas at Loiza. Mr. E. G. Smyth records the caterpillars feeding on roses, and at the Mayagüez Station (1938–59) they "seriously damaged garden peas on Las Mesas." The adults show considerable variation in the depth of coloration on the forewings, but the curved transverse band across the forewing is quite constant.



Larva of *Prodenia ornithogalli* Guenée on tobacco leaf. Natural size. (Drawn by G. N. Wolcott.)

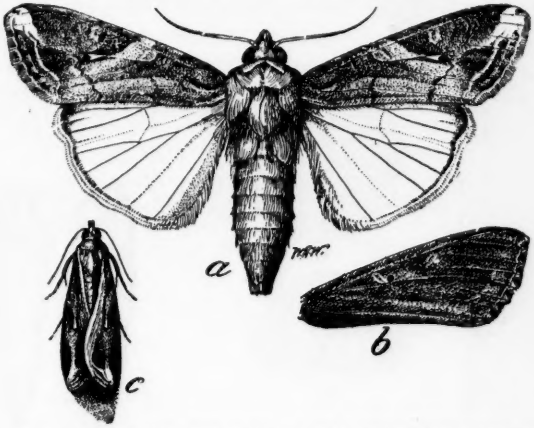
Prof. Forbes questions the occurrence of *ornithogalli* in the West Indies, tho it is common as far south as Florida. "*P. latifascia* is very like it, except the longer wings, and is sexually dimorphic in the same way: the female with more diagonal pattern, the male with a good deal of straw yellow about the middle of the wing. Aside from the longer or shorter wings, the best way to tell them apart is probably the brown terminal area which is markedly widened opposite the cell between M_1 and M_2, veins 5 and 6, in *ornithogalli*, but not widened in *latifascia*."

Prodenia pulchélla Herrich-Schäffer, listed from Puerto Rico by the earlier entomologists, has been collected at Río Piedras, Naguabo and Coamo according to Dr. Schaus (1940–195), and intercepted at light at Bayamón.

Prodenia rubrifusa Hampson was identified by Dr. Wm. Schaus from

material intercepted at light at Bayamón, and collections at Coamo, Río Piedras and Lares are noted by him (1940–195).

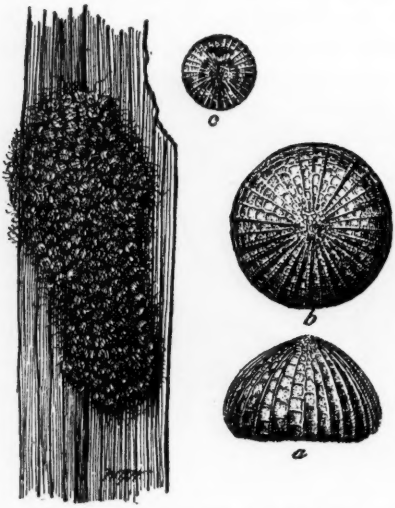
Laphygma frugiperda (Smith and Abbot) was listed from Puerto Rico by the early entomologists, Dr. Gundlach noting "la oruga daña a veces las siembras de maíz, caña y otras," and in Van Zwaluwenburg's list is number 912 on sugar cane in seed beds, on *Panicum* sp. Listed and discussed as a pest of sugar-cane by Mr. D. L. Van Dine (1913–13 and 1913–257) and Mr. E. G. Smyth (1919–143), the most extensive account of this grassworm is that by Mr. Thos. H. Jones in "Some Notes on *Laphygma frugiperda* S. & A. in Porto Rico" (Jour. Ec. Ent., 6 (12): 230–6, Concord, April 1913), and as a pest of corn and onions (1915–7), listing three Tachinid parasites,



Laphygma frugiperda (Smith & Abbot). Adult with folded wings (*c*) is natural size. (Drawn by W. R. Walton, U. S. D. A.)

one wasp, three predators and two fungi. The record of attack by *Spicaria* (*Botrytis*) *rileyi* and *Empusa sphaerosperma* given by Mr. J. R. Johnston in "The Entomogenous Fungi of Porto Rico" (Bulletin No. 10, Board Commissioners of Agr. P. R., pp. 1–33, pl. 9, fig. 1. San Juan, 1915) is quoted by Mr. J. A. Stevenson (1918–207) and by Miss Vera K. Charles (1941–729). The caterpillars are also eaten by the lizards *Ameiva exsul* and *Anolis pulchellus*, and at the Mayagüez Station (1938–102), Mr. W. K. Bailey noted that they were attacked by three species of paper-nest wasps. Despite all these factors of natural control the fall armyworm or southern grass worm continues to be the major cutworm pest of young sugar-cane, corn, fruit of tomatoes, green pods of beans, eggplant, pepper, onions, alfalfa and many grasses. It has been found burrowing into gladiolus bulbs, and also attacking small eucalyptus seedlings. It has been noted burrow-

ing into the ground to eat the sprouting eyes of sugar-cane seed-pieces. The eggs are laid in clusters covered with hair from the body of the female, sometimes on the leaves of the plant to be eaten, but quite as often on vegetation, such as the pinnae of the areca palm which can not be eaten by the small caterpillars, or on inert objects, such as posts or stones or clods of earth, from which the just hatched caterpillars must migrate before they have anything but their own empty egg-shells to eat. "It is doubtful if a single field of corn ever reaches maturity in the West Indies without

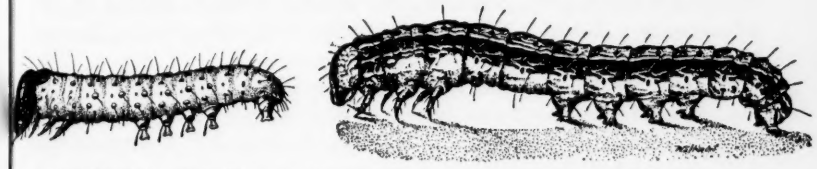


Egg-mass of *Laphygma frugiperda* (Smith & Abbot), twice natural size, and *a*, single egg from the side, *b*, from above, greatly magnified, and *c*, just about to hatch. (Drawn by W. R. Walton, U. S. D. A.)

Pupae of *Laphygma frugiperda* (Smith & Abbot), from side and from below, twice natural size. (Drawn by W. R. Walton, U. S. D. A.)

being attacked by *Laphygma*, and most corn suffers constant reinfestation." Attack on some vegetable crops can not similarly be predicted with certainty, and damage, as in the case of eggplant fruit, lima beans, and tomatoes, may not be observed until the caterpillars have attained large size, when the injury is irreparable. In fields of young cane where toads are abundant, and nothing much else exists for them to eat, they may devour large numbers of these caterpillars, excrement pellets having been found containing dozens of the characteristic skulls of the larvae marked with an inverted "Y". Up to the time that DDT became commercially

available, arsenate of lead was the standard, but not particularly effective remedy for the control of *Laphygma*, often ineffective because applied when the caterpillars were fully-grown, or so large that they could eat some of the poison with comparative immunity. Dusting young corn or cane plants with DDT gives prompt control, so immediate and so effective that this means of control is being increasingly used by many growers. The adult of *Laphygma frugiperda* has silvery white hind wings, and grey-brown fore-wings which may be almost devoid of any pattern, or in other individuals with conspicuous markings of light and dark. In the experience of Prof. Forbes the difference in pattern is purely sexual: all the males having the showy pattern and all the females being plain, as in *Prodenia latifascia*. The caterpillars show little variation and are easily recognized by the inverted "Y" on the head and four black spots arranged in a trapezoid on most segments dorsally, most conspicuous on the smaller green caterpillars but still apparent on the plump, purplish-grey fully-grown larvae.



Just-hatched caterpillar, greatly enlarged, and fully-grown caterpillar, twice natural size, of *Laphygma frugiperda* (Smith & Abbot). (Drawn by W. R. Walton, U. S. D. A.)

Xylomiges eridania (Cramer) was listed from Puerto Rico as a *Callierges* by the early entomologists, Herr Möschler (1880–138) noting "Raupe auf *Amaranthus, Solanum torvum, Phytolacca decandra.*" In addition to such weed hosts, the cutworms may also attack tomatoes, potatoes, peppers and tobacco, and are recorded from Swiss chard and mulberry, occurring in all parts of the Island. The light grey adults are common at light; repeatedly intercepted at Bayamón, Mr. E. G. Smyth having collected sixty at Hda. Santa Rita, Guánica during the summer and autumn of 1913.

Xylomiges recondita, described from Puerto Rico as a *Callierges* by Herr Heinrich B. Möschler (1890–140), has not since been found.

Xylomiges sunia Guenée was listed from Puerto Rico by Herr Möschler, Dr. Gundlach noting "la oruga se cría en *Gossypium.*" It is P.R. 1443 on Van Zwaluwenburg's list, and Dr. Richard T. Cotton (1918–287) notes it as "extremely destructive to a great many vegetable crops, being particularly abundant on chard. The small, green, dome-shaped eggs are laid in clusters of two or three hundred on the leaves, and are covered with a light white fuzz. They hatch in about four days into caterpillars that

when full grown are about an inch and a quarter long. They are dark grey in color, striped on the sides with a broad yellow band, and marked on the back with several velvety black patches." Mr. Ignacio Torres, in discussing "El Cultivo de Papas en Puerto Rico" (Rev. Agr. P. R., **24** (6): 239–242. San Juan, 1929), notes their attack on Irish potatoes. They have also been found eating celery, asparagus, green peas, alfalfa and tobacco. The adults are practically indistinguishable from *X. eridania*, their most apparent difference being a black spot or pair of black spots near the middle of the forewing towards the costal margin.

Galgula partita Guenée is listed from Puerto Rico by Herr Möschler and Dr. Gundlach.

Micrathetis triplex (Walker) is identified from San Juan, Coamo and Ensenada by Dr. Schaus (1940–199). Prof. J. A. Ramos (1947–45) collected it, as determined by Prof. Forbes, at light on Mona Island.

Hadena ? ligata was described from Puerto Rican material by Herr Heinrich B. Möschler (1880–130), and was at one time thought by Dr. Schaus to be a *Monodes*, but no specimen has been collected since the type by Dr. Gundlach.

Elaphria agrotina (Guenée) has been repeatedly intercepted at light in the metropolitan area of San Juan, and at Bayamón; Dr. Schaus (1940-200) lists collections at Aibonito, Coamo, Lares and Guánica, and Mr. J. F. Gates Clarke thus identified specimens taken by Dr. W. A. Hoffman at El Semil. The three specimens of what Mr. E. G. Smyth called a "rare brown-and-buff Noctuid" which he collected during the summer of 1913, were first determined by Dr. Schaus as the *Monodes* which Herr Möschler described (1890–127) from Puerto Rican material as *Hadena arna*.

Elaphria andersoni is described by Dr. Wm. Schaus (1940–201) from material intercepted at light at Bayamón by Mr. C. G. Anderson as having a wingspread of 13 mm., its "forewing mostly aeneous sayal brown."

Elaphria arnoides (Herrich-Schäffer) is listed by Dr. Schaus (1940–200): "a specimen from an old Porto Rico collection, with written label identification."

Elaphria deltoides, described as a *Erastria* by Herr Heinrich B. Möschler (1880–399), was identified by Dr. Wm. Schaus as a specimen intercepted at light at Bayamón, but later (1940–200) he states "no specimens have been received from Porto Rico."

Elaphria nucicolora (Guenée), listed from Puerto Rico by Herr Möschler and Dr. Gundlach as a *Monodes*, has been intercepted at light in the San Juan metropolitan area, and Mr. Frank E. Watson thus identified the dozen "Brownsville Noctuids" which Mr. E. G. Smyth collected at light during the summer of 1913 at Hda. Santa Rita, Guánica. Prof. Forbes lists additional collections at Cataño, Toa Baja, Lares, Coamo and Aguirre.

Elaphria phalega is described by Dr. Wm. Schaus (1940–201), the type from Coamo, as having a "forewing aeneous olive brown, the markings very faint," allied to "*E. nucicolora* Guenée, form *clara* Harv."

Elaphria promiscua was described as a *Caradrina* by Herr Henirich B. Möschler (1880–144) from material collected by Dr. Gundlach in Puerto Rico.

Elaphria subobliqua (Walker), listed from Puerto Rico as *Hadena chalcedonia* Hübner by Herr Möschler and Dr. Gundlach, was collected at light at Utuado by Dr. W. A. Hoffman, and Dr. Schaus (1940–201) lists it from San Juan.

Bryolymnia huastea was described by Dr. Wm. Schaus (1940–203) from a single female from Bayamón, mostly white in color, the "forewing white with black markings."

Bagisara repanda (Fabricius), listed as *Atethmia inusta* Guenée by the early entomologists, was identified for Mr. E. G. Smyth, who collected twenty-five specimens at light at Hda. Santa Rita, Guánica during the summer of 1913, as *Bagisara inusta* Guenée by Mr. Frank E. Watson. "So often was this moth seen at night on the foliage of "salcilla" (*Morongia leptoclada* = *Leptoglottis portoricensis*), that it is believed the larva must feed on that tree." The adults, identified by Dr. Schaus as *Bagisara subusta* Hübner, have three wavy lines across their light yellowish-brown forewings, the outer margin being considerably darker. Dr. Schaus lists (1940–204) additional collections at San Germán, Adjuntas and Coamo, and Prof. Forbes found it on Vieques Island as well as on El Yunque and at Lares and Isabela.

Bagisara buxea (Grote) is listed by Dr. Schaus (1940–204) from Coamo and Guayama.

Sesamia vuteria (Stoll) is listed from Puerto Rico by Dr. Schaus (1940–205): "bred from green chick pea."

Caularis undulans Walker, listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Eudryas bartholomaei* Boisduval, a large white and yellow Noctuid, was collected at light at Hda. Santa Rita, Guánica by Mr. E. G. Smyth three times during the summer of 1913. Dr. Schaus (1940–205) lists additional collections from Guayama. The anal angle of the yellowish hind wing has a conspicuous brownish lunule; the pinkish-white forewing is broadly margined with light brown, its inner edge dark brown.

Cydosia nobilitella (Cramer), listed under this name by all the early entomologists from Puerto Rico, is P. R. 1439 in Van Zwaluwenburg's list. It is a very striking moth, the forewings having six, or nine or more large white spots surrounded with purplish-brown, the ground color purplish-red; the hindwings white margined with black in the males, entirely black for the females. Mr. E. G. Smyth collected fifteen of this or the following species at light at Hda. Santa Rita, Guánica, in the summer of 1913, of

which he thought the larvae fed on *Solanum*. It is by no means a xerophytic Noctuid, however, as adults have been found at Mameyes and Río Piedras, and Dr. Schaus (1940–206) records additional collections at San Germán, Mayagüez, Coamo and Santurce.

Cydosia submutata (Walker) is identified by Dr. Schaus (1940–206) from Santa Rita, presumably the material collected by Mr. E. G. Smyth.

Eublemma cinnamomea (Herrich-Schäffer), listed from Puerto Rico as a *Thalpochares* by Herr Möschler and Dr. Gundlach, has been intercepted at light at Bayamón, as identified by Dr. Schaus. Prof. Forbes found it common on El Yunque, and has specimens from Cataño and San Germán.

Eublemma minima (Guenée) is identified by Dr. Schaus (1940–208) from Coamo and Cataño. Prof. Forbes collected it on Vieques Island.

Eublemma obliqualis (Fabricius), listed as a *Thalpochares* from Puerto Rico by Herr Möschler and Dr. Gundlach, is identified by Dr. Schaus (1940–207) from San Juan and San Germán. Prof. Forbes found it on Vieques Island, and the Cornell University collection contains specimens from seven Puerto Rican localities.

Eublemma sydolia is described by Dr. Wm. Schaus (1940–207) from a single male from Río Piedras with a wing expanse of 13 mm., the "forewing whitish irrorated with shell pink," collected by Mr. Tho. H. Jones, August 9, 1914. Other specimens were collected by Dr. M. D. Leonard at Cataño and Aguirre.

Cobubatha albipectus described by Herr Heinrich B. Möschler (1890-167) as a *Thalpochares* from material collected in Puerto Rico by Dr. Gundlach, is recognized by Dr. Schaus (1940–209) from Vieques Island: fresh material collected by Prof. Wm. T. M. Forbes.

Cobubatha coamona is described by Dr. Wm. Schaus (1940–208) from numerous specimens from Coamo and Aguirre showing considerable variation, with a wing expanse of 10 mm., "forewing with basal half rosy olivaceous, only base itself fuscous."

Cobubatha luxuriosa (Smith) is recognized by Dr. Schaus (1940–209) from Coamo.

Cobubatha putnami, described as a *Thalpochares* by Herr Heinrich B. Möschler (1890–168) from material collected by Dr. Gundlach in Puerto Rico, has not since been found locally.

Cobubatha quadrifera (Zeller), re-described from Puerto Rico as *Thalpochares grapholithoides* by Herr Möschler (1890–167), and thus listed by Dr. Gundlach, is identified by Dr. Schaus (1940–209) from Ensenada, San Germán, Aibonito and Coamo; Dr. W. A. Hoffman collected it at El Semil, as identified by Mr. J. F. Gates Clarke, and Prof. Forbes found it on Vieques Island and has specimens from five Puerto Rican localities.

Erastria minima Herrich-Schäffer is listed from Puerto Rico by Herr Möschler (1890–152) and Dr. Gundlach.

Ozarba cinda is described by Dr. Wm. Schaus (1940–210) from a single male from Coamo with wing expanse of 6 mm., a complicated wing pattern in sienna and buff.

Ommatochila mundula (Zeller), listed from Puerto Rico as a *Thalpochares* by Herr Möschler and Dr. Gundlach, has been intercepted at Mayagüez, and Dr. Schaus (1940–210) lists collections at San Germán and Coamo. It is a little brown moth the darker basal two thirds of the forewing sharply cut off from the lighter marginal area.

Amyna bullula (Grote), re-described by Herr Heinrich B. Möschler (1890–163) under the name of *Mesostrota imprimata* from material collected in Puerto Rico by Dr. Gundlach, has not since been found locally.

Amyna octo (Guenée), listed from Puerto Rico as *Mesostrota stigmatula* Snell by Herr Möschler and Dr. Gundlach, was collected at light at Hda. Santa Rita, Guánica by Mr. E. G. Smyth. He found seven individuals of this small chocolate-brown Noctuid, as identified by Dr. Schaus, of which some were presented to Mr. Frank E. Watson, but Dr. Schaus (1940–211) reports "no specimens from Porto Rico." Of the specimen which he identified, now in Río Piedras collection, the hindwings are almost if not quite as dark brown as the forewings, which bear a faint pattern and are very narrowly margined with darker brown.

Anateinoma affabilis was described by Herr Heinrich B. Möschler (1890–170) from Puerto Rican material collected by Dr. Gundlach, but no individuals have since been found.

Lithacodia apicosa (Haworth) was listed from Puerto Rico by Dr. Stahl as *Erastria nigritula* Guenée, and by Herr Möschler and Dr. Gundlach as an *Erastria*. It has not since been found locally.

Chobata discalis Walker is identified by Dr. Schaus (1940–213) from Vieques Island, and from Coamo in Puerto Rico.

Xanthoptera aurifera Walker, re-described by Herr Heinrich B. Möschler (1890–158) as *X. tripuncta* from Puerto Rican material collected by Dr. Gundlach, is identified by Dr. Schaus (1940–214) from Lares, Mayagüez, Aibonito, Manatí and Coamo. Mr. E. G. Smyth took thirty of these moths at light at Hda. Santa Rita, Guánica during the summer of 1913. They have golden yellow forewings, darker on the margins, and silvery white hindwings, gradually darkening at the outer edges.

Xanthoptera botyoides Guenée, listed from Puerto Rico by Drs. Stahl and Gundlach and Herr Möschler, has been repeatedly intercepted at Río Piedras and at Dorado.

Xanthoptera nigrofimbria Guenée was the identification by Dr. Wm. Schaus of moths intercepted at light at Bayamón.

Xanthoptera operta, as a *Krugia*, was described by Herr Heinrich B. Möschler (1890–164) from Puerto Rican material collected by Dr. Gundlach. Dr. Schaus lists a subsequent collection (1940–214) at San Juan.

Xanthoptera portoricensis was described by Herr Heinrich B. Möschler (1890–158) from material collected by Dr. Gundlach, and Dr. Schaus (1940–214) identifies as this species moths collected at Aguirre.

Heliocontia margana (Fabricius), re-described from Puerto Rican material by Herr Heinrich B. Möschler (1890–156) under the name of *Emmelia variegata*, and the variety *ochracea*, has been intercepted at Bayamón and at Mayagüez. Dr. Schaus (1940–215) notes additional collections at Ponce, Tallaboa, Ensenada, San Germán, Coamo and Aibonito. It is a little brownish moth with large, irregular whitish areas along the costal margin of the forewings. Prof. Forbes found it on Vieques Island.

Heliocontia pantherula (Herrich-Schäffer), listed by the earlier entomologists as *Emmelia uncinula* H. S., is identified by Dr. Schaus (1940–214): a little grey moth with irregular lighter areas on the forewings.

Heliocontia perstructana (Walker), listed by the earlier entomologists as *Emmelia felina* H. S. and *E. trigidula* H. S., has been intercepted at Bayamón, as identified by Dr. Schaus, and listed by him (1940–215) from Coamo.

Spragueia dama (Guenée), listed by Herr Möschler and Dr. Gundlach as an *Emmelia*, has been intercepted at light at Bayamón. Mr. E. G. Smyth collected thirty-four adults at light at Hda. Santa Rita, Guánica during the summer of 1913. Dr. Schaus determined as this species a little moth found resting on cane at Rincón, December 11, 1919, and he lists (1940–216) additional collections at Coamo and Aibonito. A large median area of light yellow, and smaller ones towards base and apex, are on the costal margin of the reddish-brown forewings of this little moth.

Graeperia costalis (Walker) has the head, collar, shoulder lappets and costal margin of forewings creamy yellow; the remainder of forewings and body golden brown. Dr. Schaus (1940–216) has identified specimens from Ensenada, Coamo and El Yunque, and Prof. Forbes has them from Aguirre and Vieques Island.

Graeperia indubitans (Walker) is listed by Dr. Schaus (1940–216) from Coamo and Ensenada.

Tarachidia flavibasis Hampson "is common in Porto Rico" according to Dr. Schaus, who lists collections from Arecibo, Aibonito, Coamo, San Germán and Ensenada. Mr. Francisco Seín found it at Lares. Prof. Forbes notes that only the male has the yellow base; the female is entirely shades of dull brown.

Tarachidia mixta, described by Herr Heinrich B. Möschler (1890–154)

as an *Acontia* from Puerto Rican material collected by Dr. Gundlach, and thus listed by him, is identified by Dr. Schaus (1940–217) from Ensenada and Coamo.

Haplostola aphelioides was described by Herr Heinrich B. Möschler (1890–163) from specimens collected in Puerto Rico by Dr. Gundlach, and was thus listed by him. It has not since been found.

Eutelia ablatrix (Guenée), listed as a *Penicillaria* from Puerto Rico by Herr Möschler and Dr. Gundlach, is identified by Dr. Schaus (1940–218) from San Germán and Coamo.

Eutelia blandula (Herrich-Schäffer), listed as a *Eurhipia* from Puerto Rico by Herr Möschler and Dr. Gundlach, is identified by Dr. Schaus (1940–218) from Coamo.

Eutelia piratica is described by Dr. Wm. Schaus (1940–218): a single male from San Germán with a wing expanse of 15 mm., mostly pinkish cinnamon, pinkish buff, vinaceous buff or vinaceous fawn, with complicated pattern in white. An adult, as identified by Prof. Wm. T. M. Forbes, was taken at light on Mona Island by Prof. J. A. Ramos (1940–45).

Eutelia pyrastis Hampson is identified by Dr. Schaus (1940–218) from Coamo and Aguirre.

Paectes arcigera (Guenée), listed from Puerto Rico by the early entomologists as an *Ingura*, has been intercepted at light at Bayamón and at San Juan.

Paectes devincta (Walker), re-described from Puerto Rico by Herr Heinrich B. Möschler under the name *Ingura vittata*, and thus noted by Dr. Gundlach to be "solamente conocida de Puerto Rico," has been intercepted at light at Bayamón.

Paectes lunodes (Guenée) is identified by Dr. Schaus (1940–220) from Coamo and Ensenada.

Paectes obrotunda (Guenée) was re-described from Puerto Rico by Herr Heinrich B. Möschler (1890–170) under the name *Ingura elegans*, and it is thus listed by Dr. Gundlach. The dozen specimens which Mr. E. G. Smyth collected at light at Hda. Santa Rita, Guánica during the summer of 1913, identified by Dr. Schaus, have a wingspread of 22 mm.; the veins of the hindwings outlined in brown; the dark grey forewings, with two major, darker, curved stripes and other less well defined markings, but hardly anything to merit the name *elegans*. Dr. Schaus (1940–221) notes collections in Vieques Island and on St. Thomas, as well as at Coamo and San Germán.

Stictoptera vitrea Guenée, listed by the early entomologists from Puerto Rico under this name, has been intercepted at light at Bayamón, as identified by Dr. Wm. Schaus.

Characoma nilotica (Rogenhofer), re-described by Herr Heinrich B.

Möschler from Puerto Rico (1890–212) under the name of *Paraxia chamaeleon* and thus listed by Dr. Gundlach, has been reared from semi-transparent, greenish-white larvae feeding on the buds and webbing together the small leaves of "sauce" or Humboldt's willow (*Salix chilensis*) at Aguadilla in January 1922. Mr. E. G. Smyth collected thirty of these small grey Noctuid moths at light at Hda. Santa Rita, Guánica during the summer of 1913, and it has also been intercepted at light at Bayamón.

Prof. Forbes doubts if this is the old world *C. nilotica*, of which the larva is supposed to feed on tamarisk. The Cornell University collection contains specimens from Cataño, Jájome Alto, Guayama, Aguirre, Coamo and San Germán.

Casandria abseuzalis (Walker) was re-described by Herr Heinrich B. Möschler (1890–147) under the name of *Pleurasympieza smithii* from Puerto Rican material, and it is thus listed by Dr. Gundlach. Mr. E. G. Smyth collected a dozen of these light brown Noctuids, as determined by Dr. Harrison G. Dyar, at light at Hda. Santa Rita, Guánica during the summer and autumn of 1913. Dr. Schaus (1940–223) records additional collections at Palmas Abajo (between Guayama and Jájome Alto) by Dr. W. A. Hoffman, and at Coamo and Manatí. On light grey forewings are zig-zag narrow bands of dark brown; the semi-transparent silvery hindwings are narrowly margined with brown. Prof. Forbes found it on Vieques Island, and has specimens from Dorado and Santurce.

Casandria ferrocana (Walker) was re-described as *Leianophora transfossa* by Herr Heinrich B. Möschler (1890–136, fig. 16) from Puerto Rican material, and under that name it is listed by Dr. Gundlach. Dr. Schaus (1940-222) notes recent collections at Guánica.

Casandria filifera (Walker) was re-described from Puerto Rican material by Herr Heinrich B. Möschler (1890–145, fig. 17) under the name of *Collomena elota*, and under that name it is listed by Dr. Gundlach. Dr. Schaus (1940–223) records a recent collection from El Yunque.

Iscadia aperta Walker was re-described as *Eucalypta schildei* from Puerto Rican material by Herr Heinrich B. Möschler (1890–148, fig. 23), and thus listed by Dr. Gundlach. Dr. Schaus (1940–224) lists collections from Coamo and Río Piedras.

Achaea ablunaris (Guenée), of which Herr Möschler (1890–202) as an *Ophisma* described the local Puerto Rican variety under the name of *hilaris*, was listed by Drs. Stahl and Gundlach. No recent collection has been made locally.

Ophisma tropicalis Guenée, listed from Puerto Rico by all the early entomologists, of which Dr. Gundlach notes "oruga en *Cupania*," has not been collected subsequently.

Mocis antillesia Hampson, listed in "Insectae Borinquenses" (1923–168) as *Mocis marcida* Guenée, as determined by Dr. Wm. Schaus, was first collected in Puerto Rico by Mr. D. L. Van Dine in December 1911, at light at Río Piedras. Several collections have since been made at light at the same locality. The larva when fully-grown is a large grey caterpillar with concealed black and white spots at the dorsal sutures, exposed on looping of the body, which feeds on the leaves of cowpeas. The adult is a large purplish-brown moth, both fore and hind wings banded; the forewings with a black spot nearly 1 mm. in diameter on inner margin near base; the males with heavily plumed hind legs.

Mocis disseverans (Walker), as identified by Dr. Wm. Schaus, has been repeatedly intercepted at light at Bayamón and in the metropolitan area of San Juan, and additional collections are noted by him (1940–226) at Coamo and Aibonito.

Mocis megas (Guenée), listed as a *Remigia* by all the earlier entomologists, has been collected at light at Bayamón, Río Piedras, Mameyes and Guánica; quite similar in general appearance to *antillesia*, but with the black spot near the base of the forewing very small or absent. The caterpillar has been found feeding on the leaves of velvet beans at Río Piedras. Dr. Schaus (1940–226) lists collections of adults at Fajardo, Arecibo, Coamo and San Germán. Prof. J. A. Ramos (1947–45) found them common at light, Sardinera Beach, Mona Island.

Mocis munda (Walker), as identified by Prof. Wm. T. M. Forbes, was collected by Mr. Harry Beatty on Mona Island, August 1944. Prof. Forbes notes that this is the smallest and most yellow species of *Mocis*, and suspects that it is "the true *repanda* of Fabricius," but is not sufficiently sure to use the name. He has additional specimens from Cuba, Haiti, St. Croix and Martinique, but not from Puerto Rico.

Mocis repanda (Fabricius), originally described as a *Noctua*, was listed from Puerto Rico by Dr. Stahl as *Remigia latipes* Guenée, and under this name and as *Remigia repanda* Fabricius, not in synonymy, by Herr Möschler and Dr. Gundlach. Indeed, the latter name was used by all the economic entomologists: thus listed by Mr. R. H. Van Zwaluwenburg, number 1507: on millet and grasses, and by Mr. D. L. Van Dine (1913–257 and 1913–31), Mr. Thos. H. Jones (1913–230 to 236, 1914–463) and Mr. E. G. Smyth (1919–144), who note the larva as a pest of sugar-cane, feeding on the leaves. The most complete account (Jones and Wolcott 1922–49) describes all stages and lists the parasites reared: *Phorocera claripalpis* Macq., *Linnaemyia fulvicauda* Walton, *Helicobia helicis* TT. from the larvae, and *Sarcophaga sternodontis* TT from the pupa, and in addition to these flies, the wasps *Chalcis robustella* Wolcott and a species of *Rogas*.

Larvae have also been noted at Morovis (Wolcott 1921–38) parasitized by a species of *Euplectrus*. The caterpillars are eaten by the lizards *Anolis pulchellus*, *A. krugii*, *A. stratulus* and *A. cristatellus*, when abundant in cane fields, and presumably would also be eaten by the introduced toad, but Dr. Wetmore reports neither larva nor adult consumed by any bird. Periods of unusual abundance of the striped looper caterpillars on fields of young cane are normally followed by several years when none are to be found, which is hardly surprising considering the number of parasites and other natural enemies which converge on an outbreak. The caterpillars are partial to the leaves of young cane, but often attack weed grasses in the cane fields, as well as meadows of malojillo or guinea grass, and young stands of elephant grass. "They follow the same pattern of seasonal abundance: our (Wolcott and Martorell 1943–92) records of injury being for October, November and December; pupae and old injury in January; one record of small caterpillars in February at Manatí and another in July at La Vega, Arecibo" for the years 1936–1941. The moths are smaller than others of the genus, lavender or purplish brown, the outer third of the wings darker, and are often attracted to light during winter months in the coastal cane areas.

As *Mocis latipes* Guenée identified by Prof. Wm. T. M. Forbes, it was recorded by Prof. J. A. Ramos (1940–45), collected at light on Mona Island.

Phurys immunis Guenée, listed from Puerto Rico by the early entomologists, is recorded by Dr. Schaus (1940–227) from Aibonito and Coamo, and from Vieques Island. It is a light grey moth, the outer third of its wings darker, with basal third of the forewings cut off by a narrow dark band.

Nymbis helvina (Guenée) is listed from Puerto Rico by Drs. Stahl and Gundlach under the name *Phurys helveola* H. S.

Nymbis garnoti (Guenée) as a *Phurys* is listed by the earlier entomologists from Puerto Rico.

Safia acharia (Cramer) is listed as *Yrias* from Puerto Rico by Dr. Gundlach, but Dr. Schaus (1940–228) is of the opinion that Herr Möschler's record is a mis-identification.

Zale erilda is described by Dr. Wm. Schaus (1940–230) from a single male intercepted at Bayamón with a wing expanse of 48 mm., the forewings mostly "light ochraceous buff" with black markings. As *Homoptera lunata* Drury he presumes this species was reported from Puerto Rico by Herr Möschler and Dr. Gundlach.

Zale exhausta (Guenée) is listed from Puerto Rico by Herr Möschler and Dr. Gundlach as an *Homoptera*.

Zale fictilis (Guenée), listed from Puerto Rico as an *Homoptera* by Herr Möschler and Dr. Gundlach, was identified for Mr. E. G. Smyth as

Homoptera terrosa Guenée by Dr. Schaus: adults at light at Río Piedras. These are large grey moths with numerous wavy dark brown bands, a double one on the hindwings being most conspicuous.

Zale setipes (Guenée) is listed as a *Xylis* from Puerto Rico by the early entomologists, and Dr. Schaus (1940–229) records a more recent collection at Coamo.

Autoplusia egena (Guenée) was identified by Dr. Wm. Schaus from a shining golden-brown adult reared from a green looper caterpillar collected on shade tobacco at Cayey in January 1923. A year later other adults were reared from looper caterpillars on tobacco at Corozal. It was noted that the caterpillars were most abundant on the tobacco growing on the hills sloping to the north; those sloping to the south and west showed little injury by any kind of caterpillar.

Autoplusia illustrata (Guenée) was intercepted at light at San Juan and determined as a *Phytometra* by Dr. Schaus.

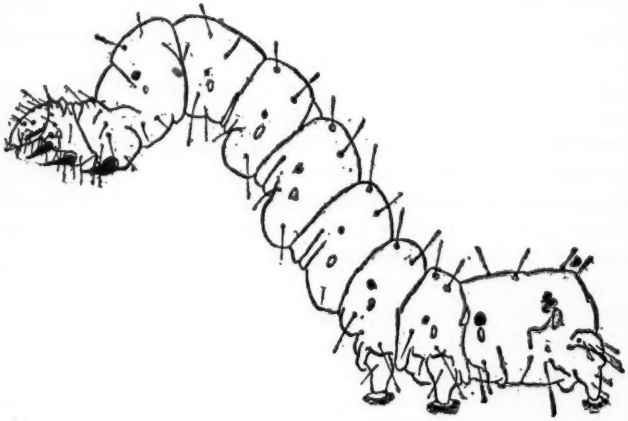
Argyrogramma admonens (Walker), as determined by Dr. Wm. Schaus, was intercepted at light at Bayamón.

Argyrogramma calceolaris (Walker), listed as a *Plusia* by Herr Möschler from Puerto Rico, is cited by Dr. Gundlach "la oruga en *Commelina*." Dr. Schaus (1940–232) notes a recent collection at Lares by Mr. Francisco Seín.

Trichoplusia ni (Hübner), as determined by Dr. Wm. Schaus, was collected at light at Hda. Santa Rita, Guánica by Mr. E. G. Smyth: five specimens during the summer and fall of 1913. These moths are rather small, light brown in color, with a very elongate silvery area on the forewings. They are the adults of the injurious "cabbage looper" of continental United States.

Pseudoplusia oo (Cramer) was listed from Puerto Rico by Dr. Stahl as *Plusia binotula* H. S., and by him and the other earlier entomologists as *Plusia rogationis* Guenée. Dr. Richard T. Cotton (1918–311) studied it as a pest on tomato, but it is possibly more seriously injurious on tobacco, being called by the growers "el agrimensor verde." Injury does not cease when the leaves are cut, for the large caterpillars continue their development eating the wilted and curing leaves in the drying shed. They may feed on other vegetables as well, having been reared to adult eating nothing but beans, cabbage, sweet potatoes or lettuce. The adults are a rich dark golden-brown, with two conspicuous silvery spots on the forewings; the smaller one almost circular, the larger one oval, less well defined at side, and outlining a question mark. They have been taken at light at Guánica as well as generally in the mountains and along the north coast, and on Mona Island by Prof. J. A. Ramos (1947–45).

Phytometra verruca (Fabricius), originally described as a *Noctua*, and by Herr Möschler and Dr. Gundlach listed from Puerto Rico as a *Plusia*, was reared by Mr. Thos. H. Jones from larvae on purslane, and subsequently by Mr. E. G. Smyth at Río Piedras on "blero" (*Hyptis capitata*). Adults have repeatedly been intercepted at light at Bayamón and San Juan, and Dr. Schaus (1940–232) records collections at San Germán and from Vieques Island. They are rather small, richly golden brown moths, the two oval silvery spots of the forewings being of very unequal size.



Larva of *Pseudoplusia oo* (Cramer), five times natural size. (Drawn by G. N. Wolcott.)

Toxonprucha diffundens (Walker), re-described from Puerto Rico as *T. amoena* by Herr Heinrich B. Möschler (1890–198), and thus listed by Dr. Gundlach, is identified by Dr. Wm. Schaus (1940–233) from Coamo, Guánica and San Germán.

Pseudyrias watsoni is described by Dr. Wm. Schaus (1940–234) from a single female from Ensenada collected by Mr. Frank E. Watson, with a wing expanse of 29 mm. mostly black, brown or similarly dull colored.

Meridyrias progenies (Guenée), listed as a *Yrias* from Puerto Rico by the early entomologists, and also in Van Zwaluwenburg's list (P. R. 1408), was collected at light at Hda. Santa Rita, Guánica by Mr. E. G. Smyth. He found these sooty little Noctuid moths, with numerous

wavy lines on both fore and hind wings, most abundant during July and August. Dr. Schaus (1940–235) notes additional collections at Coamo and Ponce.

Lyncestis acontioides (Guenée) was listed as *Stictoptera penicillum* H. S. from Puerto Rico by the early entomologists, Dr. Gundlach noting "la oruga vive en *Parkinsonia aculeata* y en *Poeppigia procera*." Dr. Schaus (1940–236) identifies moths from Mameyes, Coamo and Guánica. Those from Guánica were identified by Mr. Frank E. Watson for Mr. E. G. Smyth as *Melipotis acontioides* Guenée (= *M. sinualis* Harvey), and under this name his collections at light were listed in "Insectae Borinquenses" (1936–436), eighteen having been taken from October to December 1913. Had Smyth happened to collect after an outbreak of these caterpillars on "flamboyán" (*Poinciana regia*), such as occurred in 1937 and 1941 at Guánica, he would have found them overwhelmingly numerous. An outbreak on the flamboyán trees in Hato Rey and the Condado became so serious that it was reported in an article in "El Mundo," August 10, 1933. The landlord of a house surrounded by infested flamboyán trees lamented that one tenant had just moved out because of the annoyance of the hungry caterpillars, and others who came to look at the house would not even enter the gate. Another outbreak at Manatí defoliated trees along the road to Ciales for a long distance. Such defoliations are not serious from the point of view of the trees themselves, for flamboyán leaves grow out with surprising rapidity and a few weeks later there is no trace of injury. The caterpillars have also been reared from "palo verde" (*Parkinsonia aculeata*) at Faro de Cabo Rojo, confirming Dr. Gundlach's observation. Indeed, considering that the flamboyán was already a common tree in Puerto Rico at the time he was here, it is surprising that he failed to note it as host for these caterpillars. *Poeppigia procera* is a name not found in any modern botany, and possibly it does indeed refer to the flamboyán. The caterpillars are slender, striped with dark greenish-brown, and prefer to rest during the daytime under loose bark, crowding by the dozens into any suitable hiding-place, and later filling it with their cocoons. The adults have silvery white hindwings, deeply margined with dark brown or black, the forewings obscurely patterned in grey.

Melipotis contorta (Guenée), listed as a *Bolina*, or as *Bolina striolaris* H. S. by Dr. Gundlach and Herr Möschler, has since been found on Mona Island by Prof. J. A. Ramos (1947–45).

Melipotis famelica (Guenée), listed from Puerto Rico by the early entomologists as *Bolina leucomelana* H. S., is identified by Dr. Schaus (1940–237) from Coamo, Ponce and Guánica. More than half of the hind wings of these moths are black, but the black "does not reach the anal angle."

The forewings are mostly dark brown, with lighter area and transverse band narrowly outlined with a most convoluted black margin. Mr. E. G. Smyth took eighteen of these moths at light during October and November of 1913 at Hda. Santa Rita, Guánica, and Mr. Norberto Lugo collected many at light at Guánica Insular Forest in August 1941. Mr. Francisco Seín collected caterpillars on "salcilla" or "zarcilla" (*Leucaena glauca*) at Yauco in November 1923, which he reared to adult, but of which one larva was parasitized by a Tachinid fly recently identified by Mr. C. W. Sabrosky as *Euphorocera tachinomoides* TT. The species is not confined to the south coast, as one adult was collected at Isabela in December 1918, and the Cornell University collection has specimens from Dorado. Prof. Forbes noted them on Vieques Island, and Prof. J. A. Ramos found them on Mona Island in considerable abundance (1947–45).

Melipotis fasciolaris (Hübner), listed as a *Bolina* from Puerto Rico by Herr Möschler and Dr. Gundlach, is recognized by Dr. Schaus (1940–239) only from Aibonito. For Mr. E. G. Smyth he had previously identified as this species moths collected at light, Hda. Santa Rita, Guánica, with the most sharply defined pattern on their wings: the base of the forewings dark brown, with a straight-edged transverse light yellowish band, which may be what he subsequently described (1940–238) as *Melipotis guanicana*. Other adults, identified by Mr. Hahn W. Capps as *Melipotis fasciolaris*, have the base of the forewings dull greenish-brown, with no broad yellowish transverse band separating the basal area from the darker apical two-thirds. Many of these were collected at light in Guánica Insular Forest in August 1941 by Mr. Norberto Lugo, and others have been reared from dull, striped, blue-grey caterpillars found crowding under the bark scales of "guayacán" (*Guaiacum officinale*) at the same locality, May 1942, and farther west at the salt pools, March 1946. Prof. J. A. Ramos (1947–46) found one at light on Mona Island.

Melipotis guanicana was described by Dr. Wm. Schaus (1940–238) from a single female from Guánica, date of collection and collector not mentioned, with a wing expanse of 42 mm., the base of its fore wing "deep olive buff: a broad white medial fascia faintly outbent edged by fine black lines."

Melipotis indomita Walker is listed from Puerto Rico by Herr Möschler and by Dr. Gundlach, as *Bolina nigrescens* Grote and Robinson, var. *ochreipennis* Harvey. Prof. Forbes identifies as this species specimens labeled "Desengaño" collected by Dr. Stuart T. Danforth. Desengaño is the flag stop on the American Railroad and the Hacienda at Cartagena Lagoon, where Dr. Danforth made his most intensive observations on birds.

Melipotis januaris (Guenée) was listed as a *Bolina* by Herr Möschler,

Dr. Gundlach noting "esta especie varía mucho, v. gr. var. *limitata*, var. *bimaculata*, var. *confusa*, Möschler." Mr. R. H. Van Zwaluwenburg (1918–34) records thousands of larvae on "guamá" (*Inga laurina*) at Mayagüez in June 1917, which pupated in the ground. Adults have been intercepted at light in the metropolitan area of San Juan and at Bayamón, and Dr. Schaus (1940–237) notes additional collections at Ensenada, Aibonito and Coamo, and on Vieques Island, while Prof. J. A. Ramos found them at light, Sardinera Beach, Mona Island (1947–45).

Melipotis ochrodes (Guenée), which Dr. Schaus considers Herr Möschler listed from Puerto Rico as the varieties *bimaculata* and *confusa* of the preceding species, was identified by Dr. Harrison G. Dyar as *Melipotis manipularis* Guenée for Mr. E. G. Smyth, who collected nearly sixty specimens at light at Hda. Santa Rita, Guánica, during the summer and autumn of 1913. This is the name in Van Zwaluwenburg's list: P. R. 1435. The next year Mr. Smyth repeatedly collected larvae under the bark of the trees called locally "algarrobo de Hawaii," "bayahonda," or "mesquite" (*Prosopis juliflora*), or under trash at the base of these trees, which he reared to adult. They were found under the bark of these trees at Central Mercedita, Ponce, in 1922, and extensive collections of adults were made at light in the Guánica Insular Forest in August 1941 by Mr. Norberto Lugo. The transverse, lighter-colored band on the forewings occupies half of the basal area; the lighter area towards the apex is often irregularly margined with black.

Melipotis perpendicularis (Guenée) is listed by Dr. Schaus (1940–239) from Puerto Rico, "without precise locality."

Pararcte schneideriana (Cramer), originally described as a *Noctua*, Dr. Schaus identified as a *Cocytodes*: a single specimen collected at light at Río Piedras by Dr. Richard T. Cotton on May 1, 1916. It is a large, brownish, thick-bodied moth, with a wingspread of 76 mm., its patterned forewings narrow; the dark brown hindwings with lunules on the outer margin.

Mimophisma forbesi was described by Dr. Wm. Schaus (1940–240) from a single male from Coamo with a wing expanse of 35 mm., mostly drab in color; "forewing drab crossed by rather faint light cinnamon drab vertical lines and with a few scattered black scales."

Blosyris mycerina (Fabricius), originally described as a *Noctua*, was listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Letis atricolor* Guenée. It was later identified by Dr. Schaus as *Letis mycerina*, the name given in "Insectae Borinquenses" (1936–434), being "widely distributed in tropical America." The caterpillars have been found feeding on coffee leaves at Lares, altho possibly originally they ate those of some endemic plant or tree of the virgin tropical rain forest. The fresh adults are almost black in color, but while still alive may fade to a dull brown,

showing the wavy pattern on the wings, the largest ones having a wing-spread of close to 80 mm. They begin flying soon after sundown; in November 1921, a dozen or more were noted above Ciales sporting in a road opening. Occasionally two would snap their wings together with a sound like that made by dragonflies, and fall to the ground, scuffling in copulation. They sometimes are attracted to lights, having been intercepted at Bayamón, and are quite common in coffee fincas at the higher elevations.

Otosema odorata (Linnaeus) was listed from Puerto Rico by all the early entomologists as an *Erebus*, Dr. Gundlach noting "la oruga se alimenta de varias especies de *Cassia*, de *Pithecolobium*, etc., ocultándose durante el día entre las grietas de la corteza." It was number 1418 in Van Zwaluwenburg's list, having been reared by him on *Cassia fistula*, *Pithecolobium saman* and *Ficus* sp., but without record of anything more concerning the caterpillars. The adults have possibly the largest wing area of any moth found in Puerto Rico, mostly dull brown with innumerable lighter or darker wavy lines; a small eye-spot on the forewing and a double one on the hind wing. They are sometimes found hiding in the dark corners of a house early in the morning, and by the more superstitious thought to be an omen of death. Some houses, poorly illuminated at night, with dark interior walls and densely shaded by surrounding trees, may prove especially attractive to these big, black, fluttery moths, one or more of them haunting it nearly every twilight both night and morning.

Peosina numeria (Drury) was listed from Puerto Rico by all the early entomologists, but has not since been collected locally.

Hemeroblemma rengus (Poey), listed as a *Brujas* from Puerto Rico by Herr Möschler and Dr. Gundlach, has not since been collected locally.

Latebraria amphipyroides Guenée, listed from Puerto Rico by Herr Möschler, and by Dr. Gundlach noted with the "oruga en especies de *Cassia*," has not since been collected locally.

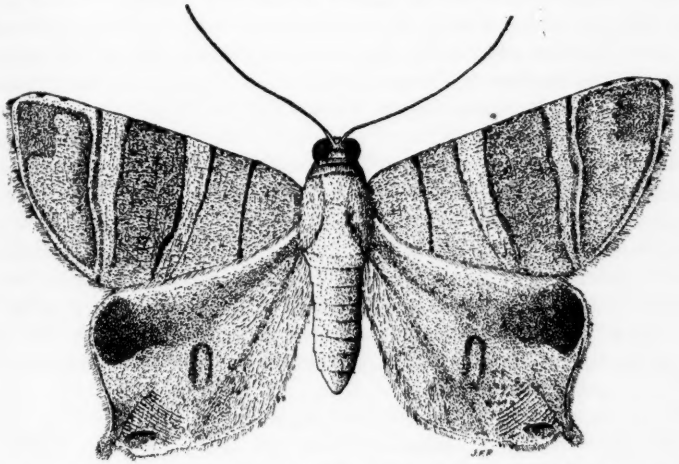
Hemicephalis characteria (Stoll), listed from Puerto Rico by Herr Möschler and Dr. Gundlach, is recognized by Dr. Schaus (1940–244): a single specimen from Mameyes.

Pseudohemiceras krugii was described by Herr Heinrich B. Möschler (1890–176) from Puerto Rico, and listed by Dr. Gundlach. Mr. E. G. Smyth collected two adults of this brick-red Noctuid at light at Hda. Santa Rita, Guánica in the summer of 1913, and later he reared adults from larvae boring in twigs of "roble" (*Tabebuia pallida*), at Río Piedras. As observed by Drs. Donald de León and Luis F. Martorell, other species suffer similar injury: *Tabebuia rigida* at Guavate, Cayey: *T. heterophylla* at Ponce and Guánica; and Dr. Martorell noted the latter species and *T. lucida* attacked on Mona Island. The burrow opening of a caterpillar is at a crotch of a small branch, clogged with excrement and uneaten bits of

leaves, for the larva not only feeds on the pith of the twig, but at night sallies forth to drag to the entrance of its tunnel entire leaves, to be devoured in safety with its body inside the burrow.

Concana mundissima Walker, listed from Puerto Rico as his *Thelidora splendens* by Herr Möschler, and by Dr. Gundlach, is recognized by Dr. Schaus (1940–245) from Ensenada and Coamo, and from Vieques Island.

Adiopa disgrega, described by Herr Heinrich B. Möschler as a *Hadena* from Puerto Rico (1890–128), and thus listed by Dr. Gundlach, was found very abundant at light by Mr. E. G. Smyth at Hda. Santa Rita, Guánica, during the latter half of 1913, fifty-six specimens in all being taken, some



Adult of *Eulepidotis addens* (Walker), four times natural size. (Drawn by José F. Pietri.)

of these being identified by Dr. Schaus as being in the genus *Tarachidia*. These are medium-sized light grey moths with a black inverted question mark and other less pronounced black markings on the costal margin of the forewings; the silvery hindwings margined with grey.

Dyomyx juno was described by Herr Heinrich B. Möschler (1890–197) from Puerto Rico, and it is thus listed by Dr. Gundlach. It is known only from Puerto Rico, and no additional specimen has been collected since the type was found.

Eulepidotis addens (Walker), originally described as a *Palindia*, and as *Palindia variabilis*, var. *obscura* re-described from Puerto Rican material by Herr Heinrich B. Möschler (1890–195), was thus listed by Dr. Gundlach. It is a sleek little brownish moth, a darker basal cross-bar and two

double ones on the forewings; a washed-out eyespot on the tailed hindwings. Its small, green leaf-folding caterpillars have twice been found at Cayey feeding on the tender leaves of "guaba" (*Inga vera*) during the winter, and after forming slight cocoons, emerging as adults identified originally by Dr. Harrison G. Dyar and subsequently by Mr. J. F. Gates Clarke. It has been taken at light at Río Piedras, and intercepted at light at Bayamón and at Mayagüez. Dr. Schaus (1940–247) also reports collection at Lares.

Eulepidotis hebe was described as a *Palindia* by Herr Heinrich B. Möschler (1890–195) from Puerto Rican material, and it is thus listed by Dr. Gundlach. It has been intercepted at light at Bayamón, and Dr. Schaus (1940–248) recognizes as this species adults from Coamo.

Eulepidotis mabis (Guenée) was listed from Puerto Rico as a *Palindia* by Herr Möschler and Dr. Gundlach, but has not since been found locally.

Eulepidotis modestula (Herrich-Schäffer) was listed by Herr Möschler and by Dr. Gundlach from Puerto Rico as a *Palindia*, and under this name is in Van Zwaluwenburg's list (P. R. 1406). Mr. E. G. Smyth collected twenty-six of these "medium buff" moths at light at Hda. Santa Rita, Guánica, during the latter half of 1913, and it has been intercepted at light at Bayamón. Dr. Schaus lists additional collections (1940–248) at Coamo and San Germán, as well as in Cuba and Haiti. Dr. R. C. Smith and Mr. André Audant found its larvae defoliating trees of "ceiba" (*Ceiba pentandra*) in Haiti, and it may be presumed that this is its normal host in Puerto Rico also. The creamy yellow forewings have a darker margin, and submarginal darker cross-bars; the hindwings but the faintest trace of a tail, and a poorly-formed eye-spot.

Eulepidotis superior (Guenée) was re-described from Puerto Rican material by Herr Heinrich B. Möschler (1890–196) under the name of *Palindia dewitzii*, and is thus listed by Dr. Gundlach. It has not since been collected locally. Dr. Stahl also lists from Puerto Rico *Palindia inferior* H. S.

Noropsis hieroglyphica (Cramer) was listed from Puerto Rico by Dr. Stahl as *Euglyphia fastuosa* Guenée, and as *Noropsis fastuosa* Guenée by Dr. Gundlach and Herr Möschler, the latter noting "Raupe auf *Corchorus siliquosus*." It is P. R. 1421 in Van Zwaluwenburg's list, and he gives an extended account of it (1918–33), the caterpillars feeding on *Waltheria americana* and *Morongia leptoclada*. "The larvae are more or less gregarious, and drop to the ground when disturbed. The full grown larva is about 25 mm. long and about 4 mm. across the head. The ground color of the body is bluish or greenish white, with a black stripe running around the body on each segment. The segments are divided from one another by a narrow black line. The anal plate and head are reddish-brown, the collar shiny black. The oval pupa case, about 22 x 10 mm., is formed of parchment-like material on the stem of the food plant, and is covered with grass

and bits of leaves." The cocoons were very abundant on fence posts in cane fields at Yauco in September 1921, and two years later the caterpillars caused considerable damage to young trees of beefwood (*Casuarina equisetifolia*) at Hda. María Antonia, Guánica, boring into their tender trunks, apparently seeking a place to pupate. The adults have plain, unmarked abdomens and hindwings, but the collar and sides of thorax are light yellow, the shoulder lappets brownish with purplish iridescence; the forewings mostly yellowish with strongly contrasting hieroglyphic marks of dark brown, surrounding elongated areas of iridescent lavender. While normally most abundant in the more xerophytic areas of the Island, adults have been taken at light at Río Piedras, and Dr. Schaus (1940–248) lists additional collections at Ponce, Coamo, Mayagüez, Lares and Cataño.

Litoprosopus hatuey (Poey), originally described from Cuba as a *Noctua*, is recognized by Dr. Schaus (1940–249) from a specimen collected by Mr. Aug. Busck in Puerto Rico, and one by Dr. Wm. T. M. Forbes on Vieques Island.

Baniana relapsa (Walker), listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Baniana significans* Walker, and thus identified by Dr. Schaus for Mr. E. G. Smyth: adults collected at light at Hda. Santa Rita, Guánica in 1913, is a fawn-colored moth; the forewings with a conspicuous dark brown triangle near the base, the marginal third equally dark on strongly-curved basal side, but fading towards the margin; the marginal third of the hindwings also somewhat darker. Prof. Forbes notes that "only the male has black on the wings; the female has only top of head and collar black." He has specimens from Guayama and Coamo, and from Lares collected by Mr. Francisco Seín.

Rivula pusilla was described by Herr Heinrich B. Möschler (1890–234) from Puerto Rican material collected by Dr. Gundlach. It is recognized by Dr. Schaus (1940–250): a single specimen from Lares.

Selenis suero (Cramer) was listed from Puerto Rico by the early entomologists. Dr. Schaus (1940–250) recognizes from Naguabo and Coamo this species "widely distributed in tropical America."

Selenis sueroides Guenée is listed by Dr. Stahl from Puerto Rico, and Dr. Schaus (1940–251) identifies it from Coamo, noting that it is "evidently rare in Porto Rico, but common in Cuba." Prof. Forbes has specimens from Coamo, Aguirre and Toa Baja.

Selenis portoricensis was described by Herr Heinrich B. Möschler (1890–214), the type from Puerto Rico, collected by Dr. Gundlach. It is an inconspicuous brownish moth, the costal margin of the forewings very broadly and somewhat irregularly light grey. Mr. Thos. H. Jones reared this moth, as determined by Dr. Schaus, from "yerba de ciénaga" (*Aeschynomene sensitiva*) at Río Piedras in July 1914, and adults have subsequently been

collected at Río Piedras, and in the Guánica Insular Forest at light by Mr. Norberto Lugo.

Aluaca eubolialis Walker was identified by Dr. Schaus (1940–251) from Yauco and Aguirre, and Prof. J. A. Ramos (1947–46) found a single adult as identified by Prof. Wm. T. M. Forbes at light, March 4, 1944, at Sardinera Beach, Mona Island.

Glympis concors Hübner was re-described as *Diastema flavicapilla* by Herr Heinrich B. Möschler (1890–162) from Puerto Rican material collected by Dr. Gundlach. Mr. Thos. H. Jones found small green caterpillars stretched out along the leaflets or leaf stems of "gallito" (*Agati grandiflora*) in March 1912, which were reared to little dark-brown moths, spotted with darker brown, identified by Dr. Harrison G. Dyar as *Aluaca agilaria* Druce. Adults have also been intercepted at light at Bayamón., and in March 1949 were again found in large numbers at Río Piedras.

Trissophaes serpentinifera (Walker), as identified by Mr. J. F. Gates Clarke, is a large moth with wingspread of over 100 mm., its forewings light brown with unremarkable pattern, but bright yellow hindwings, margined with brown, with an enormous black serpent entering from the anal margin. One adult was found on the mosquito bar in the morning at Guajataca, April 23, 1940, and another at Camp Doña Juana, Villalba. This is the nearest to a *Catocala* that Puerto Rico can show.

Graphigona regina (Guenée), listed from Puerto Rico as *Ophideres gubernatrix* Guenée by Herr Möschler and Dr. Gundlach, has not since been collected locally.

Alabama argillacea (Hübner), originally described as an *Aletia*, was listed from Puerto Rico by all the early entomologists and is number 1401: on cotton, in Van Zwaluwenburg's list. It is not a permanent resident of Puerto Rico, but outbreaks have been noted since that in 1905 at Aguadilla, reported by Mr. O. W. Barrett (1906–23) and Mr. D. W. May (1906–11); at Hatillo in July 1919 reported by Mr. E. G. Smyth (1920–122); another at Hatillo in the summer of 1922 (Wolcott 1924–6), in the winter of 1922 at Cabo Rojo, reported by Mr. W. V. Tower (1924–13), continued the next year at Boquerón (Wolcott 1924–97); in all the cotton regions in 1930–31, as reported by Dr. M. D. Leonard (1931–114 and 119, 1932–130) but not on Vieques Island during these years, as noted by Mr. Arturo Riollano (1931–104); and again in the Cabo Rojo-Lajas region in the months of October and November of 1935 and 1938, extending to the north coast at Quebradillas in December, and returning again to Lajas in November 1939. In recent years, no important commercial outbreak has occurred, as is indicated by the untouched stocks of arsenate of lead held by the Co-operativa, but in 1942, a few caterpillars were noted on cotton at Río Piedras, and somewhat later at Coamo. "The Mystery of *Alabama argillacea*" (Amer.

Naturalist, **63** (684): 82–87. New York, Jan.–Feb. 1929) consists not only in its sudden appearances in such enormous numbers, and equally sudden disappearances, but in the stimuli in the tropics which can start such migrations from equatorial regions where it presumably is present at all times of year. The continued spread of outbreaks in the southern states of the United States from the Río Grande region in south Texas, and from the West Indies into south Florida, advancing thru the entire cotton region, finally ends in migratory flights of moths across the Great Lakes and the

Adult of the Cotton Caterpillar, *Alabama argillacea* Hübner, three times natural size. (Drawn by Fritz Maximilien.)

St. Lawrence into southern Canada. All of these adults perish without oviposition, and fresh infestations in the following or succeeding years originate in the West Indies or Mexico, or further south; never a return from the north. Mr. André Audant is convinced that the species is present at all times in Haiti, with caterpillars feeding on the leaves of cotton around Cap-Haitien during the winter, when the plants in the Cul-de-Sac and Presque Isle are maturing their bolls and have dropped all their yellowed leaves. Migration of the moths is not only necessary to ensure a fresh supply of food for their progeny, but during an outbreak of the larvae, so many are parasitized by the wasps *Apanteles aletiae* Riley and species of *Brachymeria*, and so many pupae are destroyed by *Sarcophaga sternodontis* TT, that a fresh generation can only escape mass attack when developing

in a location far removed from that in which the previous generation attained maturity. The moths are sleek in appearance, well fitted for making long flights, grey in color, with but the most indistinct of markings on the forewings. The eggs are laid individually, usually on the underside of cotton leaves, but several or many moths may oviposit on the same leaf. The caterpillars feed only on cotton leaves, and altho not gregarious, usually occur in such numbers as to completely defoliate all or most of the plants in large fields. Those which attain full size most rapidly spin loose cocoons in folded-over leaves, which later may be eaten by other caterpillars, leaving the purplish red chrysalis dangling, suspended by a few scattered threads. The mortality among such pupae is often total, being aided by the presence of Sarcophagid flies, alert to oviposit in any dead, dying or injured insect. On perennial cotton, as in southern Haiti, which with abundant rains may develop vegetatively to a height which makes the harvesting of bolls difficult, repeated defoliation by these caterpillars is definitely beneficial, but on Sea Island cotton, as in Puerto Rico, their prompt control is invariably desirable. Arsenate of lead is the standard remedy, and it continues to be used, despite the lower price of calcium arsenate, because of its superior adhesiveness to cotton leaves. In recent years the superior effectiveness of DDT and others of the newer insecticides in killing caterpillars has been demonstrated elsewhere, but not in Puerto Rico, due to non-occurrence of outbreaks on which to make the tests.

In the spring of 1949, after seven years when this pest had not been noted in Puerto Rico, it appeared in considerable abundance at Isabela. Not only were DDT and the gamma isomer of benzene hexachloride effective in control, but, as observed by Dr. Luis F. Martorell, a strip of cotton sprayed with chlordan before infestation had begun to appear continued to remain free from caterpillars despite heavy infestation in unsprayed fields near-by. Such repellent action of chlordan for the moths, preventing their laying eggs on sprayed cotton, has not previously been noted anywhere. All of the new insecticides are so much more promptly effective than was arsenate of lead that the growers who kept a stock on hand to be prepared for expected outbreaks can but regret their caution.

Anomis erosa Hübner is a bright golden yellow moth, the distal half of the forewings somewhat darker, the pattern outlined with narrow curving brown lines; a sharp angle on the outer margin. In January 1922, Mr. John D. More reared a caterpillar collected on cotton at Sabana Grande which Dr. Schaus identified as *Cosmophila erosa*. Under this name it had been listed from Puerto Rico by the early entomologists, Dr. Gundlach noting "la oruga se cría en *Plumbago*, también en las *Althaea*." It was thus identified by Mr. Frank E. Watson for Mr. E. G. Smyth, who had taken forty of these moths at light at Hda. Santa Rita, Guánica during the latter half of 1913. It has been intercepted at Bayamón, and additional records

of collection at San Germán, Coamo and on El Yunque are given by Dr. Schaus (1940–253). Mr. Francisco Seín found it at Lares.

Anomis flava fimbriago (Stephens) is listed from Puerto Rico by Dr. Wm. Schaus (1940–253). Prof. Forbes notes that it looks almost exactly like *A. erosa*, but the male antennae are thicker in his specimens from Haiti.

Anomis gundlachi is the new name which Dr. Wm. Schaus (1940–254) applies to what the early entomologist in Puerto Rico listed as *Anomis fulvida* Guenée. "The *A. fulvida* of Gundlach represents accurately the male specimen from Cuba to which I apply his name. This specimen has a tuft of hairs at the base of the costa underneath, and was collected near Havana."

Anomis illita Guenée was listed from Puerto Rico by the early entomologists, and has since been taken at light in the San Juan area, at Bayamón and at Mayagüez. Dr. Schaus (1940–254) lists it from Coamo.

Anomis impasta Guenée is easily confused with *Alabama argillacea*, the caterpillars of both feeding on cotton leaves, but the larva of the *Anomis* is essentially solitary, never having been known to occur in such abundance as to constitute an outbreak. The moths are also similar, but the forewings of *Anomis* are darker, with a more distinct pattern and more golden than the dull clay of *Alabama argillacea*, and they have a distinct angle on the outer margin. Mr. E. G. Smyth, writing of the "Cotton Insects of Porto Rico" (Ent. News, **21** (5): 121–125. Lancaster, May 1920) confused the two, and recommends the destruction of "cadillo" (*Urena lobata*) and "malva de caballo" (*Malachra alceifolia* or *rotundifolia*), on which he had reared this *Anomis*, as a measure of control for *Alabama*. Dr. Harrison G. Dyar first identified this species from Puerto Rico as his *Anomis doctorum*, in error in "Insectae Borinquenses" (1936–440) as *doctorium*. No adult has been collected at light, but adults have been reared from larvae feeding on cotton at Humacao, Guayama, Villalba, Guánica, Camuy, Garrochales, Manatí and Vega Baja, and Dr. Schaus (1940–254) notes it as "widely distributed in tropical America."

Gonitis editrix Guenée is a light brownish moth, its forewings sharply angled on the outer margin and unevenly quartered by transverse lines. It was listed from Puerto Rico by all the early entomologists, Dr. Gundlach noting "la oruga se cría en *Triumfetta*." Mr. E. G. Smyth in the summer of 1916 at Río Piedras, reared several of these moths, as identified by Mr. Frank E. Watson, from "cadillo" (*Triumfetta* spp.), noting them as "a duller, darker brown than *Anomis erosa*." Dr. Schaus (1940–255) notes additional collections at Coamo and Ensenda.

Gonitis praerupta, described as an *Anomis* by Herr Heinrich B. Möschler (1890–173), is noted by Dr. Gundlach as "no está indicada de otras tierras." This is unquestionably true because the host of the larva is the endemic

"maga" (*Montezuma speciosissima*), a tree which does not occur elsewhere. The smaller caterpillars are entirely green, exactly matching the color of maga leaves, but in the last instar become tinged with pink, which becomes more intense as the larva approaches maturity. The chocolate-brown adults, with somewhat clearer hind wings, as identified by Mr. J. F. Gates Clarke, have been reared at Isabela and Toa Baja. Dr. Schaus (1940–254) writes "I have seen no material from Porto Rico, but I consider *G. hedys* Dyar the same species (type from Cuba in U. S. National Museum)," in which opinion he can hardly be correct, for the larvae of the Cuban species must feed on the leaves of a different host.

Plusiodonta thomae Guenée, listed from Puerto Rico by Herr Möschler and Dr. Gundlach, was collected at El Semil by Dr. Wm. A. Hoffman, as identified by Mr. J. F. Gates Clarke.

Duriga nealcesalis (Walker) is recognized from Coamo by Dr. Schaus (1940–256) as being in his new genus.

Cecharismena cara was described by Herr Heinrich B. Möschler (1890–166) from specimens collected by Dr. Gundlach in Puerto Rico. Dr. Schaus (1940–256) recognizes it from Coamo, and from Palmas Abajo, a locality not to be found on most maps, but located north of Guayama to the west of the road to Cayey, where collections were made by Dr. Wm. A. Hoffman.

Cecharismena nectarea was described by Herr Heinrich B. Möschler (1890–165) from Puerto Rican material collected by Dr. Gundlach, and listed by him. As *Zagorista debora* Druce, Dr. Wm. Schaus identified these "handsome brown and grey moths" for Mr. E. G. Smyth, who had reared them from "sacatrapos" (*Caperonia palustris*) at Río Piedras during the summer of 1916. The basal third of the forewing of this little moth is sharply cut off by a broad, transverse lighter band, which is irregularly and less sharply defined apically. Prof. Forbes has specimens from Coamo and Toa Alta.

Parachabora abydas (Herrich-Schäffer), re-described by Herr Heinrich B. Möschler (1890–197) under the name of *Penicillaria cuprea* from Puerto Rican material collected by Dr. Gundlach, was thus listed by him. Dr. Wm. Schaus considered Möschler's species as being a *Eutelia*, and it is thus listed in "Insectae Portoricensis" (1923–167), and with present synonymy in "Insectae Borinquenses" (1936–429) under Möschler's specific name. Mr. E. G. Smyth collected only five of these moths at light at Hda. Santa Rita, Guánica during the latter half of 1913, but elsewhere it is quite common, Dr. Schaus (1940–257) listing collections from Lares, Isabela, San Germán and Guayama, as well as from Vieques Island. The forewings of the adult are rich purplish-brown, as are also the outer margins of the silvery hindwings.

Gonodonta clotilda (Stoll) was listed from Puerto Rico as *G. maria*

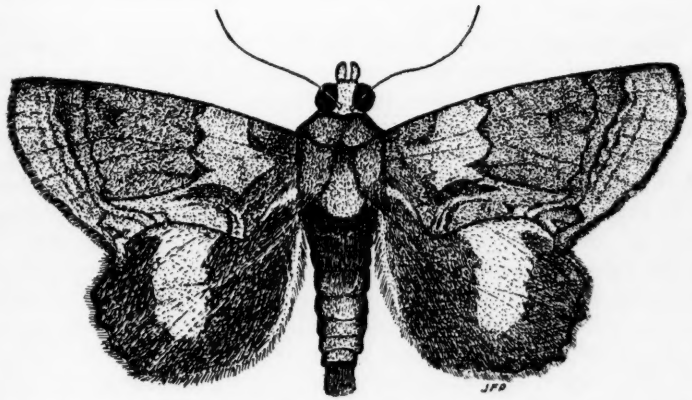
Guenée by Herr Möschler, Dr. Gundlach noting "oruga en *Anona glabra* y *palustris*, *Bocagea virgata*, *Nectandra*."

Gonodonta bidens (Hübner) was identified by Dr. Wm. Schaus as an *Athysania*: adults intercepted at light at Bayamón.

Gonodonta hesione (Drury) was listed from Puerto Rico by Herr Möschler and Dr. Gundlach. Adults intercepted at light at Bayamón have been identified by Dr. Schaus as this species.

Gonodonta incurva (Sepp), listed by all the early entomologists as *G. teretimacula* Guenée from Puerto Rico, Dr. Gundlach noting "la oruga come *Artanthe*," is recognized by Dr. Schaus (1940–258) from Lares.

Gonodonta marmorata Schaus is recognized from Lares by Dr. Schaus (1940–258). He thinks this is presumably what Dr. Stahl listed as *Gonodonta uxoria* Cramer, and all the early entomologists listed as *Gonodonta soror* Cramer. An adult determined by Mr. Hahn W. Capps, collected by Dr. Luis F. Martorell at Villalba, May 19, 1940, has the distal half of the inner margin of the forewing cut out, and a complicated pattern of rich brown, orchid and lavender; the hindwings with a large bright yellow spot in the middle, margin very dark brown. The head, thorax and abdomen are dark brown.



Adult of the velvety black Higuillo Caterpillar, *Gonodonta nitidimacula* Guenée, a little more than twice natural size. (Drawn by José F. Pietri).

Gonodonta nitidimacula Guenée, as identified by Dr. Harrison G. Dyar, is what Herr Möschler listed from Puerto Rico as *G. latimacula* Guenée of which Dr. Gundlach noted "la oruga en *Artanthe* y *Pothomorphe*." Both of these are of the Piperaceas, and the distinctive larvae have repeatedly been noted since on them as well as on "higuillo" (*Piper amalago* or *medium*) at Río Piedras, Cayey, and generally in the lower coffee regions where

these plants are most abundant. As described in "Insectae Portoricensis" (1923–176), the caterpillar is "entirely black except for yellow clypeus, two bright yellow semi-circular spots on the sides of the first segment, two narrow reddish-orange spots on the fourth segment and two small yellow spots dorsally; two small reddish-orange spots on the sides of the seventh segment, four larger on the eighth, two large ones on the ninth and tenth and two small ones on the eleventh, all lateral, and two large crescents on the hump of the twelfth, dorsally. When fully-grown, it forms a cocoon on a branch by fastening together many bits of cut-up leaves with their edges sticking out." The adults have creamy white heads; the size of the bright yellow spots on the hindwings varies considerably, as does also in details the pattern of purplish-brown and lavender of the forewings.

Calpe aequalis (Walker) is listed as an *Oraesia* from Puerto Rico by Herr Möschler and Dr. Gundlach.

Calpe excitans (Walker), listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Oraesia metallescens* Guenée, an oriental species not found in the Americas, is recognized by Dr. Schaus (1940–259) from specimens intercepted at light at Bayamón.

Sudariophora fastigiata (Herrich-Schäffer), listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Pseudocaple tristriga* H. S., was doubtfully identified by Dr. Schaus in 1923, specimens reared from undetermined host at Boquerón, as *Phiprosopus albiguttata* Herrich-Schäffer. The moths exhibit considerable variation in appearance, the hindwings and abdomen of some being dull yellow; the head, thorax and forewings light brown, with a diagonal, lighter-colored, stripe extending from the apex to about the middle of the inner margin of the forewing. Others are considerably darker, the diagonal stripe being merely the margin of the darker-colored marginal area. Some have a small white orbicular, others a darker one, and Dr. Schaus (1940–260) notes that Dr. Gundlach "thought that Herrich-Schäffer's three species, *albiguttata*, *fastigiata* and *tristriga* represented one species." The larvae, as noted in "Insectae Portoricensis" (1923–177), are looper caterpillars, about 30 mm. long, grey in general appearance due to irregular, waved, longitudinal, narrow stripes of yellow, or orange edged with yellow, alternating with broader stripes of greyish lavender margined with darker lavender. Two pairs of prominent yellow warts on the most elevated abdominal segments are covered with short fine brown hairs. Setae and their bases black. Head creamy and opalescent, with rows of aggregations of orange-yellow dots and dark brown ocelli, mouth-parts creamy and opalescent. They spin cocoons of light yellow silk, thick and roughly quadrangular, 6 x 20 mm. Adults have been collected at light at Coamo.

Antiblemma andersoni was described by Dr. Wm. Schaus (1940–261) from a drab-colored moth with a wing expanse of 19 mm. intercepted by

Mr. C. G. Anderson at light at Bayamon. Prof. Forbes has specimens from Cayey and Lares, the latter collected by Mr. Francisco Seín.

Antiblemma astyla was described from Puerto Rico as a *Capnodes* by Herr Heinrich B. Möschler (1890–215) from material collected by Dr. Gundlach. It has not been found since and Dr. Schaus (1940–261) is of the opinion that it "is the male of *A. sterope* (Cramer) or *A. rufinans* Guenée. Both species are common in Cuba."

Antiblemma anhypha (Guenée) is listed as a *Capnodes* from Puerto Rico by Herr Möschler and Dr. Gundlach.

Antiblemma concinnula (Walker) was re-described as *Capnodes priscilla* by Herr Heinrich B. Möschler (1890–216) from Puerto Rican material collected by Dr. Gundlach. Dr. Schaus (1940–260) recognizes it from fresh specimens from Lares.

Antiblemma marita, originally described by Dr. Schaus as a *Capnodes* from Cuba, is identified by him (1940–261), specimens from Coamo.

Antiblemma prisca, described by Herr Heinrich B. Möschler (1890–216), from material collected in Puerto Rico by Dr. Gundlach, as a *Capnodes*, is recognized by Dr. Schaus (1940–261): specimens from Coamo.

Antiblemma sterope (Cramer), listed from Puerto Rico by Herr Möschler and Dr. Gundlach as a *Capnodes*, has not recently been collected locally.

Massala obvertens (Walker), of which Herr Heinrich B. Möschler (1890–215) described the variety *insularis* of *Capnodes turtur* Felder and Rogenhofer from material collected in Puerto Rico by Dr. Gundlach, has since been found at Ensenda and Coamo, according to Dr. Schaus (1940–262), and collected at light at Dorado by Dr. Wm. A. Hoffman.

Euthermesia absumens (Walker) was re-described by Herr Heinrich B. Möschler (1890–263) under the name *Metallata variabilis*, and thus listed by Dr. Gundlach. It has not been found since locally.

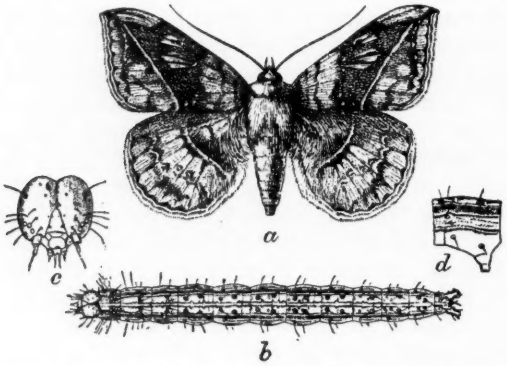
Bendis bayamona was described by Dr. Wm. Schaus (1940–264), "the male, with a wing expanse of 31 mm., very closely allied to *Bendis formularis* Hübner, distinguished by the underside of the forewing—hair brown, the inner margin narrowly whitish; the female nearer *Bendis irregularis* Hübner." Prof. Forbes considers this the Puerto Rican and Virgin Island race of the mainland *Bendis formularis*.

Bendis formularis Hübner was listed under this name by Herr Möschler and Dr. Gundlach, but Dr. Stahl had the name *Bendis impar* Guenée. Mr. E. G. Smyth took nine specimens of this "chocolate-brown barred Noctuid" at light at Hda. Santa Rita, Guánica, during October, November and December 1913, and two at Río Piedras in January 1917. It has been intercepted at light at Bayamón, and Dr. Schaus (1940–264) lists collections at Santurce, Coamo, Aibonito, Lares and Arecibo. Dr. Gundlach noted the larvae on *Cassia obtusifolia*, and they have been found at Río Piedras on "morivivi" or "sensitiva" (*Mimosa pudica*).

Bendis gurda Guenée, originally described from St. Thomas, was collected at light by Prof. J. A. Ramos (1947–46) at Sardinera Beach, Mona Island, as determined by Prof. Wm. T. M. Forbes. It has not been found in Puerto Rico.

Bendis magdalia Guenée, originally described from French Guiana, was listed from Puerto Rico by Herr Möschler and Dr. Gundlach.

Anticarsia gemmatalis Hübner, the velvet bean or cowpea caterpillar, was listed from Puerto Rico by all the early entomologists as a *Thermesia*. According to Dr. Schaus (1940–206), it occurs from the United States to Paraguay, and in the Galapagos Islands. Outbreaks may occur at any point in Puerto Rico, the caterpillars having been found on alfalfa, peanuts and the foliage of the "gallito" tree (*Agati grandiflora*). Mr. H. K. Plank



The Velvetbean Caterpillar, *Anticarsia gemmatilis* Hübner: *a*, adult, *b*, larva from above, *c*, head of larva, *d*, one segment of larva, from the side. (After Chittenden, U. S. D. A.)

(1945–27) notes an outbreak on soybeans at Mayagüez, controlled by the fungus *Spicaria prasina* (Maubl.) Saw., but the identification by Miss Vera K. Charles of that eliminating outbreaks on this host at Isabela and at Loíza Aldea was *Spicaria rileyi* (Farl.) Charles, as recorded in "Epidemics of Fungus Disease Control Insect Pests in Puerto Rico" (Jour. Ec. Ent., **33** (1): 201–2. Menasha, February 1940). Under optimum weather conditions of high humidity and temperature for the development of this fungus, extensive outbreaks may be controlled with total efficiency. The diseased caterpillars crawl to outermost leaves or branches, and there immobilized, are soon covered with a greenish-white film of spores. On the contrary, during dry weather no fungus appears, and entire fields of cowpeas or velvet beans may be defoliated unless artificial means are taken. The appearance of these caterpillars is often so sudden that farmers have the

greatest difficulty in protecting their crops, but the present availability of DDT now makes artificial control comparatively simple. The caterpillars vary considerably in the amount of green, black and intermediate coloration they show, but rearing will indicate that they are all the same species. The adults also show considerable variation in both pattern and depth of coloration.

Anticarsia elegantula (Herrich-Schäffer), listed from Puerto Rico by Herr Möschler and Dr. Gundlach, is by the latter thought "es probable que ésta y la especie precedente sean iguales." Prof. Forbes has a female collected by Mr. Francisco Seín at Lares which "fits this species or form, being pale, greenish, and lacking the white submarginal dots on under side."

Sylectra congemmalis Hübner, re-described as *Syllectra fictilina* by Herr Heinrich B. Möschler (1880–440), and listed from Puerto Rico by him and Dr. Gundlach, has not since been found locally.

Sylectra erycata (Cramer), listed from Puerto Rico by Herr Möschler and Dr. Gundlach, has been identified by Dr. Harrison G. Dyar (unlabeled specimen); by Mr. J. F. Gates Clarke, (a specimen collected at Río Piedras in August 1939) and intercepted at light at Bayamón. It has flattened antennae, combed on one side, ending in a curved whip; blood-orange wings, three transverse bands on the forewings, one more prominent on the hindwings. Dr. M. D. Leonard collected it on Vieques Island.

Sylectra lucifer as a *Syllectra* was described by Herr Heinrich B. Möschler (1890–267), and thus listed by Dr. Gundlach.

Ephyrodes cacata Guenée, listed from Puerto Rico by Herr Möschler and Dr. Gundlach, has been recognized by Dr. Schaus (1940–267) from Coamo.

Azeta repugnalis (Hübner), listed by Herr Möschler and Dr. Gundlach from Puerto Rico, is recognized by Dr. Schaus (1940–268) from Aguirre, and has been collected at light, as identified by Prof. Wm. T. M. Forbes, by Prof. J. A. Ramos (1947–45) at Sardinera Beach, Mona Island.

Orthogramma coppryi Guenée, as *Thermesia icterodes* Felder and Rogenhofer, is listed by Dr. Gundlach from Puerto Rico, remarking "no observada por Krug ni por mí. Möschler no dice quién la cogió." It has not been found since.

Epidromia pannosa Guenée, listed from Puerto Rico by Herr Möschler and Dr. Gundlach, is recognized by Dr. Schaus (1940–269) from Catano and Coamo. It has also been intercepted at light at Bayamón.

Epidromia pyraliformis, as identified by Prof. Wm. T. M. Forbes, possibly a Walker species described from Santo Domingo, was collected at light by Prof. J. A. Ramos (1947–46) at Sardinera Beach, Mona Island.

Epidromia rotundata Herrich-Schäffer was listed from Puerto Rico by Dr. Stahl.

Focilla angularis was described from Jamaica by Herr Heinrich B. Möschler and identified by him from Puerto Rico, specimens collected by Dr. Gundlach, and listed by him.

Epitomiptera orneodalis (Guenée) was identified by Dr. Schaus as a *Tortricodes*: an inconspicuous little brownish moth of which Mr. E. G. Smyth had taken two at light at Hda. Santa Rita, Guánica in 1913, and of which Dr. Richard T. Cotton had reared a male from a larva on tomato, at Río Piedras. Dr. Schaus (1940–271) states "no males have been received from Porto Rico," having forgotten about the one he returned, and lists collections at Adjuntas and on El Yunque. A larva feeding on a papaya leaf, intercepted at Isabela, when reared to adult, proved to be this species, and in the Report of the Mayagüez Station for 1938 (1939–118) is the record of the larva of this little moth feeding on bamboo. To these varied host plants, Dr. Schaus adds lima beans.

Epitomiptera alucitalis (Guenée) is listed by Dr. Schaus (1940–271) from Lares.

Lophoditta tuberculalis (Herrich-Schäffer), re-described by Herr Heinrich B. Möschler (1890–230) as *L. perspicillaris*, and thus listed by Dr. Gundlach, is recognized by Dr. Schaus (1940–271): specimens from Lares.

Kyneria utuadae was described by Dr. Wm. Schaus (1940–272) from a type collected by Dr. Wm. A. Hoffman at Utuado: an olive colored moth with a wing expanse of 22 mm., "forewing below light mouse gray." It is presumed that this is what he had previously determined as *Epitomiptera pterophalis* Guenée, as listed in "Insectae Borinquenses" (1936–442).

Mastigophorus demissalis was described by Herr Heinrich B. Möschler (1890–233) from Puerto Rican material collected by Dr. Gundlach, and is thus listed by him. It has been intercepted at light at Bayamón, and collected at El Semil by Dr. W. A. Hoffman, as identified by Mr. J. F. Gates Clarke.

Mastigophorus jamaicalis Schaus is recognized by its describer (1940–272) from specimens taken at Lares and Adjuntas.

Hypenula complectalis Grote, as identified by Prof. Wm. T. M. Forbes, was found by Prof. J. A. Ramos (1947–46) "common at light, Sardinera Beach, April 4–7, June 29, July 20, 1944" on Mona Island. It is not reported from Puerto Rico.

Phlyctaina irrigualis was described by Herr Heinrich B. Möschler (1890–229) from Puerto Rican material collected by Dr. Gundlach. Dr. Schaus (1940–273) recognizes as this species specimens from Coamo.

Tetanolita mutatalis was described as a *Scelescepon* by Herr Heinrich B. Möschler (1890–230) from Puerto Rico, under which name it was listed by Dr. Gundlach. It has been repeatedly intercepted at light at Bayamón and Dr. Schaus (1940–273) lists additional collections at Río Piedras,

Dorado, Adjuntas, Aibonito, Coamo, Lares and San Germán. It is a small brownish moth, the female with darker brown triangles along the outer margin of the forewing, and one larger crescentric mark towards the center, the male having a complicated pattern of brown and grey.

Lophophora clanymoides was described by Herr Heinrich B. Möschler (1890–228) from Puerto Rican material collected by Dr. Gundlach. Dr. Schaus (1940–274) notes recent collections at Lares, Coamo and by Dr. W. A. Hoffman at Palmas Abajo, which is between Guayama and Jájome Alto. This moth has been repeatedly intercepted at Bayamón, and Prof. Forbes found it on Vieques Island.

Physula peckii was described by Herr Heinrich B. Möschler (1890–232) from Puerto Rican material collected by Dr. Gundlach. It has not since been found.

Carteris oculatalis was described as a *Zanclognatha* by Herr Heinrich B. Möschler (1890–225) from Puerto Rico, and it is thus listed by Dr. Gundlach. Altho with an extensive neotropical distribution, it has not since been found locally.

Bleptina acastusalis Walker, re-described from Puerto Rican material by Herr Heinrich B. Möschler (1890–219) as *Anagoa placidalis*, and thus listed by Dr. Gundlach, has not since been found here. It was originally described from Santo Domingo, and Prof. J. A. Ramos (1947–46) records the collection at light, of two specimens, as determined by Prof. Wm. T. M. Forbes, from Sardinera Beach, Mona Island.

Bleptina atymnusalis (Walker), a common species in Cuba, is recorded by Dr. Schaus (1940–275) from Ensenada, and by Prof. J. A. Ramos (1947–46) from Mona Island.

Bleptina araealis (Hampson) is identified by Dr. Schaus (1940–276) from Coamo.

Bleptina limatalis was described as an *Anagoa* by Herr Heinrich B. Möschler (1890–218) from Puerto Rico, and it is thus listed by Dr. Gundlach. Dr. Schaus had previously advised that it was a synonym of *B. menalcasalis* Walker, and it is thus listed in "Insectae Borinquenses" (1934–443). He has since identified females from Ensenada.

Bleptina nigromaculatalis was described by Herr Heinrich B. Möschler (1890–218) as an *Anagoa* from Puerto Rican material collected by Dr. Gundlach, and it is thus listed by him.

Belptina priassalis Walker was re-described from Puerto Rican material by Herr Heinrich B. Möschler (1890–226) under the name of *Bleptina subjecta*, and it is thus listed by Dr. Gundlach. It has not since been found locally.

Aglaonice hirtipalpis (Walker), re-described from Puerto Rican material by Herr Heinrich B. Möschler (1890–227) under the name *Aglaonice*

snelleni, and thus listed by Dr. Gundlach, has not since been collected locally.

Mursa subrufa (Warren), re-described from Puerto Rican material by Herr Heinrich B. Möschler (1890–222) under the name *Sisputa gracilis*, and thus listed by Dr. Gundlach, is recognized by Dr. Schaus (1940–276) from specimens from Coamo, and those collected by Dr. Wm. A. Hoffman at Palmas Abajo, between Guayama and Jájome Alto. It was repeatedly intercepted at light at Bayamón, and identified under Möschler's name, as indicated in "Insectae Borinquenses" (1936–443).

Hormoschista latipalpis (Walker), re-described from Puerto Rico by Herr Heinrich B. Möschler (1890–221) as *H. pagenstecheri*, has not since been found locally.

Bomolocha conditalis, described by Herr Heinrich B. Möschler (1890–222) from Puerto Rico as a *Hypena*, and thus listed by Dr. Gundlach, is identified by Dr. Schaus (1940–277): a specimen from Coamo.

Bomolocha exoletalis (Guenée), listed as a *Hypena* by Herr Möschler and Dr. Gundlach from Puerto Rico, has not since been found locally.

Bomolocha umbralis Smith, re-described from Puerto Rican material by Herr Heinrich B. Möschler (1890–223) under the name of *Hypena cervinalis*, and thus listed by Dr. Gundlach, has been intercepted at light at Bayamón.

Ophiuche degesalis (Walker), re-described by Herr Heinrich B. Möschler (1890–224) from Puerto Rican material collected by Dr. Gundlach, under the name of *Hypena vinculalis*, has not since been found locally.

Ophiuche lividalis (Hübner), listed from Puerto Rico by Herr Möschler and Dr. Gundlach as a *Hypena*, is recognized by Dr. Schaus (1940–279): a specimen from Lares. Prof. Forbes states that "this specimen is really **consilalis** Walker. I have *lividalis* only from Africa."

Ophiuche minualis (Guenée) was identified by Dr. Schaus in 1923 as an *Anepischetos*: two little brown moths reared by Mr. E. G. Smyth at Río Piedras during the summer of 1916 from "escoba" (*Sida carpinifolia* and *S. antillensis*). Prof. Forbes notes additional collections by Dr. Stuart T. Danforth at Cartagena Lagoon by Mr. Francisco Seín at Lares, and by himself with Dr. M. D. Leonard at Aguirre and Coamo.

Ophiuche porrectalis (Fabricius), originally described as a *Phalaena*, and re-described from Puerto Rican material by Herr Heinrich B. Möschler (1890–225) as *Hypena incertalis*, has been identified by Dr. Schaus (1940–279) from specimens collected at Aibonito, Coamo and Lares.

Notodontidae

Nystalea ebalea (Cramer) is listed from Puerto Rico by the early entomologists, Dr. Gundlach noting "la oruga vive en *Comocladia* y en

Spondias." Prof. Wm. T. M. Forbes (1930–45) notes a recent collection at Coamo. Mr. Francisco Seín found an adult, as identified by Dr. Wm. Schaus, resting on the branch of a tree at Río Piedras, and another was intercepted at San Juan. This is a large brown moth with a wing expanse of over two inches, the apex of the forewing bluntly rounded "with a contrasting pale spot," the veins and margin of the hindwing also brown.

Purplish-red caterpillars, found resting on leaves of "tapón blanco" *Calypthranthes pallescens*, in Guajataca Gorge October 9, 1945, doubled up so that they resembled bird excrement, were possibly one of the following Notodontids, but were so small when found that they were not reared to adult. They had extremely large heads; elongate, narrow necks with an oval brownish mark dorsally; four sharply-pointed but fleshy humps on dorsum of body, and an even larger hump on the next to the terminal segment; much lengthened hind legs. Dorsally they are more or less spotted with whitish flecks.

Nystalea nyseus (Cramer) is listed from Puerto Rico by all the early entomologists, Dr. Stahl calling it a *Cyrrhesta*. It has not since been found locally.

Proelymniotis aequipars (Walker) was listed as *Nystales divisa* Möschler by Dr. Gundlach and Herr Möschler from Puerto Rico.

Rifargia distinguenda (Walker), a shining pale gray moth, was listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Symmerista dubia* Möschler.

Hippia insularis (Grote), listed as an *Edema* from Puerto Rico by Herr Möschler and Dr. Gundlach, is by the latter noted as "la oruga se crió en *Cupania*." Prof. Wm. T. M. Forbes (1930–47) describes the moth as being "mottled, dull grey with a triangular whitish costo-apical shade; the apical area below is shaded with darker gray; 35 mm."

Sphingidae: Sphinx Moths

Herse cingulata (Fabricius) was listed from Puerto Rico by Dr. Stahl as a *Macrosila*, and by the other early entomologists as a *Sphinx*, Herr Möschler (1890–111) noting "Raupe auf Convolvulaceen: *Ipomaea batatas, trilobata, bona nox*, u. s. w." As *Phlegethontius convolvuli* Linn. it is mentioned by Mr. Thos. H. Jones (1915–7) as a pest of sweet potato of minor importance. In Van Zwaluwenburg's list it is number 918: on sweet potato. Adults quite often come to light, having been collected at Río Piedras, intercepted at Bayamón, while Prof. Wm. T. M. Forbes (1930–50) records it at Mayagüez and (1931–344) from Vieques Island, being "easily distinguished by the pink on the body" and on the hindwings. Mr. E. G. Smyth noted all all-devouring outbreak during December 1918 along the northwestern coast from Arecibo to Aguadilla, the caterpillars after having

eaten all the sweet potato leaves, and of such wild hosts as goat's food morning glory, attacked any other green vegetation available. "Farmers at Hatillo say that about December 10th the larvae were seen by millions, and that after devouring all sweet potato vines in one field, they migrated to another in hordes, crawling over one another "como un río de hormigas." Many were parasitized by Tachinid flies, *Belvosia bifasciata* F., but the caterpillars themselves are so large as to be avoided by all except such large birds as blackbirds and grackles. The farmers were helpless before such an invasion. No tests have since been made with DDT or other of the newer insecticides to determine if control might be possible if noted when the caterpillars were small, and before they had done much damage.

Cocytius antaeus antaeus (Drury), listed from Puerto Rico by all the early entomologists as an *Amphonyx*, is noted by Dr. Gunlach with "la oruga se cría en *Anona muricata*." Mr. E. G. Smyth found a partly grown larva on this host, "guanábana," at Río Piedras, heavily parasitized by *Apanteles* maggots, and had earlier found an adult in his room at the Casa Grande of Hda. Santa Rita, Guánica. Numerous adults have been taken at light at Río Piedras, and intercepted at Bayamón. They are by far the largest sphinx moths to be found in Puerto Rico, with wing expanse of seven and a half inches. Three segments of the abdomen have large lateral yellowish spots, and the base of the hindwing is yellowish; its outer half is dark brown, as are also the veins in the transparent inner portion; the forewings are grey, patterned in dark brown or black. Prof. Forbes (1930–52) notes that "the caterpillar has only the stripe leading to the horn, distinct."

Cocytius cluentius (Cramer) as an *Amphonyx* was listed from Puerto Rico by all the early entomologists, and one unlabeled specimen is in the Río Piedras collection. The Rev. A. Miles Moss, of Belém do Pará, Brasil, (Nov. Zool., **28:** pl. 2. 1920) records the larva feeding on *Annona*, rarely on *Piper*.

Cocytius duponchel Poey, originally described from Cuba, "will certainly be taken in Porto Rico," according to Prof. Wm. T. M. Forbes (1930–51), but in fact has not been collected locally to date.

Phlegethontius (or **Protoparce**) **sextus** Johansson var. **jamaicensis** Butler, the tobacco or tomato hornworm, was listed from Puerto Rico by all the early entomologists; Drs. Stahl and Dewitz as *Macrosila carolina* L., and Herr Möschler and Dr. Gundlach as *Sphinx carolina* L., the latter noting "muy dañina al cultivo del tabaco, y en las huertas al tomate (*Lycopersicum*)." Mr. W. V. Tower (1908–36) found the eggs parasitized by *Telenomus monilicornis* Ashmead, but this seems to be its only recorded parasite. Mr. Arthur H. Rosenfeld, commenting on "The Food of Porto Rican Lizards" (Jour. Ec. Ent., **18** (2): 422–3. Geneva, April 1925),

describes the fight between an adult moth and the lizard *Anolis cristatellus*, which the lizard finally won. The caterpillars are eaten by the boat-tailed grackle or "mozambique," but not in such numbers as to be a serious limitation on their abundance. The eggs weigh 0.001 gr., and the just hatched larva 0.0004 gr., while the fully-grown larva weighs from 5.0 to over 6.0 gr., having eaten over 25.0 gr. of fresh tobacco leaves in attaining its growth. Two-thirds of the weight of the food has been voided as excrement. The adults weigh only a tenth as much as the food which the caterpillars consumed, as was shown in experiments conducted "On the

Egg, just-hatched caterpillar and fully-grown caterpillar of the Tobacco Hornworm, *Phlegethontius sextus jamaicensis* Butler, less than natural size. (Drawn by G. N. Wolcott.)

Pupa of the Tobacco Hornworm, less than twice natural size. (Drawn by F. Sefn.)

Amount of Food Eaten by Insects" (Jour. Dept. Agr. P. R., **9** (1): 47–57, ref. 4. San Juan, January 1925). Despite the relatively enormous amount of food which one caterpillar destroys, the hornworm is normally not a serious pest in Puerto Rico. Most of the caterpillars are killed when still small by the constant application of insecticides for the control of fleabeetles and other pests, and laborers almost automatically destroy the hornworms in the course of their other work. On old tobacco left for seed, or on volunteer plants, or in abandoned fields, the caterpillars may strip the plants,

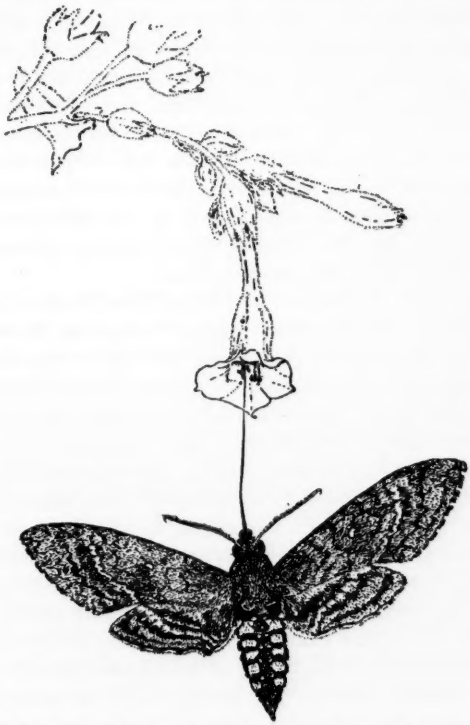
but strictly speaking, this is not commercial injury. In the same way, control is almost perfect in commercial tomato plantings, because insecticides must be applied for the control of other insect pests, and but rarely do hornworms even get started. The caterpillar may eat the leaves of *Solanum torvum*, as was first noted by Herr C. Moritz (1836–382) long ago, but this is quite exceptional, and such wild alternate hosts are of little importance. Moths have been taken at light in all parts of the Island, and Dr. Luis F. Martorell noted them at the lighthouse on Mona Island. These and other sphinx moths were so abundant, indeed, that Coast Guardsmen stationed there slept under mosquito-bars, not for protection

The "Mozambique": a natural enemy of the Tobacco Hornworm. (Drawn by F. Sefn.)

against mosquitoes, but to prevent their sudden awakening by having these big moths descend upon them.

Phlegethontius rusticus rusticus (Fabricius) was listed from Puerto Rico by Dr. Stahl as a *Macrosila*, and by the other early entomologists as a *Sphinx*, Dr. Gundlach noting "la oruga vive en *Sesamum* y en *Tecoma stans*." It was listed from Mayagüez by Mr. R. H. Van Zwaluwenburg (P. R. 1431), and has been collected at light at Río Piedras by Mr. E. G. Smyth, as determined by him. It is somewhat larger than *P. jamaicensis*, its plump abdomen is less conspicuously marked with yellow spots, its forewings are extensively barred with white.

Phlegethontius brontes (Drury), of which Mr. B. Preston Clark as a *Protoparce* (New England Zoological Club, **4:** 100. Boston, March 21, 1919) described the variety **smythi** from Puerto Rico, the type from Río Piedras, September 1, 1916, collected by Mr. E. G. Smyth, was listed as *Sphinx brontes* Drury by all the early entomologists. It has since been



Adult of the Tobacco Hornworm, *Phlegethontius sextus jamaicensis* Butler, less than natural size. (Drawn by F. Sefn.)

intercepted at Bayamon, and Prof. Forbes notes additional collections from San Germán and Coamo Springs. He writes: "After handling three specimens I think it more like a species than merely a race of *brontes*. The wings are much wider than of any other *Phlegenthontius* that I know, and it looks quite different." The adult has light grey forewings with an inconspicuous darker pattern; the hindwings are dark brown except for the anal angle. The specimen taken by Dr. Luis F. Martorell at Villalba has shorter wings

and a more sharply defined pattern on the forewings. The larva of the type form of this species, described from Jamaica, is similar to that of *P. jamaicensis*, but has orange spiracles, and according to Dr. Gundlach, feeds on *Tecoma*.

Protambulyx strigilis (Linnaeus) was listed from Puerto Rico by all the early entomologists, Dr. Gundlach noting "la oruga vive en *Comocladia* y también en *Erythroxylon*." "The larva is rough with high triangular head, as is usual in the Ambulicinae, with several pale oblique stripes, and a longitudinal subdorsal one on the thorax," according to Prof. Forbes (1930–55). "The last oblique is stronger than the others which sometimes are absent." The adult has narrow, yellowish-brown forewings, deeply cleft on the inner margin, and more intense yellow hindwings, with three irregularly transverse darker bands and a darker inner margin. The local race was described as **portoricensis** by Mr. B. Preston Clark (Proc. New England Zool. Club, **12:** 79. Boston, 1931), having a broad border, the antemedial spot near inner margin very large.

Pseudosphinx tetrio (Linnaeus) was listed from Puerto Rico by all the early entomologists, Dr. Gundlach noting "oruga en *Plumiera*." Prof. Forbes (1930–55) describes the caterpillar as "black, transversely striped with cream, with red head and tail. It is very conspicuous and feeds on frangipanni," making no distinction between the red-flowered "alhelí" (*Plumiera rubra*), the white-flowered "alhelí cimarron" (*Plumiera alba*), the common species in Puerto Rico, and the white-flowered *Plumiera obtusa* of Mona Island. Altho present on these specific hosts wherever they occur, as at Mameyes, Loíza Aldea, Pt. Cangrejos, Río Piedras, and Dorado, the caterpillars often assume outbreak proportions in the xerophytic regions, one at Ballena in the Guánica Forest having been noted during the summer of 1915. On the plateau of Mona Island in the spring of 1940 all the trees on the western half of the Island were completely defoliated, and many half-grown caterpillars were migrating to those nearer the lighthouse, which still had some uneaten leaves. The female moths are exceptionally large by comparison with the males, and dozens of their dead bodies were to be seen at the base of the lighthouse. At night, mingled with tobacco hornworm moths, they were a veritable pest, smashing into the panes of glass around the light, and disturbing the Coast Guardsmen sleeping in the rooms below. The moths are mostly light grey in color, marked with black, the male with "a conspicuous dark patch resting on the middle of the costa; the female is paler, much larger and without the patch."

Isognathus rimosa Grote, of which Mr. B. Preston Clark (Proc. New England Zoological Club, **8:** 8. Boston, January 1922) described the local variety as **wolcotti**, was listed from Puerto Rico by Dr. Dewitz as an *Anceryx*, and by Herr Möschler and Dr. Gundlach as a *Dilophonota*,

both noting that the larvae fed on the leaves of *Plumiera*. No specimens have been collected since that of the type of the variety, and that was an unlabeled specimen of which the locality of collection was unknown. "The caterpillar is striped irregularly in two shades of gray," according to Prof. Forbes (1930–56), "with irregular white lateral spots, and a filiform horn," the type form having first been described from Cuba.

Erinnyis alope (Drury) was first listed from Puerto Rico by Dr. Dewitz as an *Anceryx*, and by the other early entomologists as a *Dilophonota*, Dr. Gundlach noting "la oruga se cría en *Carica papaya*." According to Prof. Forbes (1930–57), the "caterpillar with black thoracic patch, including a red ring, and with a black lateral line," may also feed on cassava or "yuca" (*Manihot utilissima*). The caterpillars are by no means conspicuous, and even when the injury and their excrement on the ground underneath is obvious, one may experience considerable difficulty in detecting them. The parasitic wasp *Apanteles americanus* (Lepeletier) apparently has no such trouble, and the shining white cylinder of the combined cocoons of the hundreds of maggots which may develop in a single caterpillar is often found in plantings of papayas. Its value in control of the papaya sphinx is considerably limited, however, by the numerous hyperparasites which emerge from the cocoons of the parasite, and have often been confused with it. The sphinx moths has brown forewings, the inner margin often lighter in color; the hindwings are yellow with broad brownish margin.

Erinnyis crameri Schaus, first determined by Mr. E. G. Smyth comparing the specimen which he had taken at light at Río Piedras in 1916 with the illustration in Holland's "Moth Book," has since been intercepted at light at Bayamón, and Prof. Forbes (1930–59) notes collection at Ponce. Its body and forewings are quite dark, the inner margin much lighter; the hindwings are mostly a dark red (the color of raw meat), narrowly margined with brown. "Caterpillar with two red bars on thorax, the posterior bar with a black spot on it. Found on *Tabernaemontana*" *oppositifolia* or "pegoge."

Erinnyis ello (Linnaeus) is considered by Dr. W. J. Holland ("The Moth Book," p. 58) "quite the commonest of all the hawkmoths of the American tropics." It was listed from Puerto Rico as an *Anceryx* by Dr. Dewitz, and by all the other early entomologists as a *Dilophonota*, Dr. Gundlach noting "la oruga se cría en *Jatropha manihot*." He continues: "muchas orugas mueren, porque un himenóptero pequeño pone centenares de huevos en una sola oruga. Las larvas de estos himenópteros, que son *Microgaster flaviventris* Cresson, salen del cuerpo, cada una forma un capullito blanco uno al lado del otro y estos todos juntos parecen una mota de algodón, pegada en el peciolo u hoja de la planta." It is presumed that *Micro-*

gaster flaviventris is in synonymy with *Apanteles americanus* (Lepeletier), as this parasite has repeatedly been more recently identified. The caterpillars vary greatly in general appearance; those of the same size found at the same time may be green, brown or grey, with lateral stripes from head to horn and dark dorsal patch on thorax. The adults have hindwings of an ugly red, margined with black; the forewings are light grey, with inconspicuous pattern for the female, but with a dark, interrupted stripe from base to apex for the male. They have repeatedly been collected at light at Río Piedras, intercepted at Bayamón, and Prof. Forbes (1931–344) notes collection on Vieques Island, while Prof. J. A. Ramos (1947–47) found one at light on Sardinera Beach, Mona Island. Mr. Thos. H. Jones reared adults from larvae feeding on *Chamaesyce hyssopifolia* (or *Euphorbia hypericifolia*), and caterpillars are sometimes found also on papaya.

Erinnyis domingonis (Butler), as identified by Mr. B. Preston Clark, was collected at street light in the plaza of Río Piedras by Dr. Richard T. Cotton, May 21, 1917. By comparison with other moths of the genus, it is very small, with grey forewings and reddish hindwings, without appreciable pattern.

Erinnyis lassauxi (Boisduval) form **merianae** Grote was listed by the early entomologists from Puerto Rico, Dr. Gundlach noting "la oruga se cría en *Carica papaya*." It has not since been found locally.

Erinnyis obscura obscura (Fabricius) was listed from Puerto Rico by the early entomologists as *Dilophonota stheno* Hübner. Prof. Forbes (1930–59) records collection at Ponce and (1931–344) on Vieques Island, the larva feeding on *Gonolobus*.

Erinnyis oenotrus (Stoll) was listed from Puerto Rico by Dr. Dewitz as an *Anceryx*, and by the other early entomologists as a *Dilophonota*, but has not since been collected locally.

Pachylia ficus (Linnaeus) was listed from Puerto Rico under this name by the early entomologists, Dr. Gundlach noting "la oruga se cría en especies del género *Ficus*." At Río Piedras, the caterpillar has been noted on the leaves of the rubber tree, *Castilla elastica*, and also feeding on the leaves of the vine "yedra" (*Ficus pumila* or *Ficus repens*). It is somewhat more orange-yellow than the underside of the leaves of the latter host: a light green, almost entirely covered, except at sutures, with small yellow-orange spots, giving a roughened appearance. Two yellow lateral stripes start at the spinnerets and end at the short horn, and there are eight diagonal stripes on each side. The head is large and joined closely to the body, which is largest over the median prolegs. The younger caterpillars have six dark green dorsal spots. Adults have repeatedly been noted at light at Río Piedras, and are common everywhere on the Island, Prof. Forbes (1931–344) noting collections on Vieques Island and Prof. J. A.

Ramos (1947–47) on Mona Island. The anal angle of the dark brown and yellow hindwings is tipped with cream; the velvety brown forewing has a conspicuous eliptical light area at apex.

Madoryx oiclus (Cramer), a medium-sized Sphinx with lighter and darker grey forewings, deeply cleft on outer margin and with two silvery spots, was reared from a larva pupating under a rosebush at Río Grande.

Epistor lugubris (Linnaeus) is a dark grey sphinx with deeply cleft forewings and a small O-mark, repeatedly collected at light at Río Piedras. As an *Enyo* it was listed by all the early entomologists, Dr. Gundlach noting "la oruga vive en varias especies de *Cissus* o *Vitis*." The Rev. A. Miles Moss, of Belém do Pará, Brasil, (Nov. Zool., **27:** 397. 1920) figures the caterpillar, which has eight or nine oblique side-stripes and a complete subdorsal one.

Cautethia noctuiformis (Walker) was listed from Puerto Rico by Dr. Dewitz as an *Oenosanda*, and by Herr Möschler and Dr. Gundlach as *O. grotei* Henry Edwards. It is the smallest of the West Indian Sphingidae, with barred brown and grey forewings, the basal half of the hindwings yellow, the margin dark brown. It has been found at light on Mona Island by Dr. Luis F. Martorell, and in the Guánica Forest by Mr. Norberto Lugo. "Bejuco de berac" (*Chiococca alba*), a common xerophytic vine, present on Mona Island and extensively distributed in Puerto Rico, is the host for these caterpillars, as noted by Dr. Harrison G. Dyar.

Perigonia lusca (Fabricius), of which Prof. Forbes (1930–63) believes that the local form is *interrupta* Walker, was listed from Puerto Rico by the early entomologists, Dr. Gundlach noting "la oruga vive de *Genipa*, *Rondeletia*, *Gonzalea*, y otras rubiaceas." Indeed Prof. Forbes gives coffee as host for the green larvae "with seven side-stripes and a subdorsal stripe," and Mr. Cesario Pérez reared it on "palo pelado" (*Duggena hirsuta*) at Martín Peña. The costal margin and anal angle of hindwings of these moths is yellow, the broad outer margin a darker brown than on the body or the forewings. They have been taken at light at Río Piedras and Mayagüez.

Aëllopos blaini Herrich-Schäffer is listed from Puerto Rico by the early entomologists under the name *Macroglossa aedon* Boisduval, but has not since been found locally.

Aëllopos fadus (Cramer) was identified by Prof. Forbes (1930–64) from adults reared by Mr. Francisco Seín at Bayamón, from caterpillars on "jagua" (*Genipa americana*), of which half were parasitized by a species of *Apanteles*. The largest dark brown adult has a wingspread of two and half inches; its fourth abdominal segment is covered with white scales; of the two series of transparent spots on the forewing, those in the outer series number from four to seven, the inner series is in a double row.

Aëllopos titan (Cramer) was identified by Prof. Forbes (1930–64) from the same lot of reared material of which the others were called *A. fadus* by him, and considered "doubtless a straggler," quite ignoring the fact that all were reared from a single collection of eight caterpillars on a single host.

Aëllopos tantalus (Linnaeus) var. **zonata** (Drury) was listed from Puerto Rico by all the early entomologists, Dr. Gundlach noting "se cría en plantas de la familia de las rubiaceas, v. g. *Genipa, Randia, Alibertia.*" Prof. Forbes (1930–65) records collections at five Puerto Rican localities, and notes that "the transparent spots on the fore wing" are in a single line and number but "three, the upper one largest, the middle normally smallest." These are day-flying moths, of which Dr. Luis F. Martorell noted one on flowers of *Moringa oleifera* on Mona Island in the spring of 1940.

Pholus fasciatus (Sulzer) was listed by all the early entomologists from Puerto Rico as a *Philampelus*, Dr. Gundlach noting "la oruga se cría en *Jussiaea.*" It is P. R. 1426 in Van Zwaluwenburg's list. It has been repeatedly found on *Jussiaea*, at Río Piedras and at Martín Peña, Prof. Forbes (1930–66) noting the caterpillars as being "green, or red, black and white, or yellow, with eight slender oblique stripes." They did not happen to occur in the years when Prof. James G. Needham was making intensive observations on the primrose willow, and indeed have not been noted in the metropolitan area since 1923, but adults were collected at Mayagüez in 1927 and 1929, all three records being for the month of April. Adults have a broad, cream-colored "Y" extending from apex to base of the forewing; the anal and outer margins of the hindwing are bright pink.

Pholus labruscae (Linnaeus) is listed from Puerto Rico by all the early entomologists as a *Philampelus*, Dr. Gundlach noting "la oruga se cría en especies del género *Vitis,*" and Van Zwaluwenburg giving it P. R. number 1425 in his list. It has been reared from larvae on the wild grape vine, *Cissus sicyoides*, at Isabela, and the beautifully shaded green and greenish-brown and greenish-pink adults have been repeatedly noted at light in the metropolitan area, intercepted at Bayamón, and reported by Prof. Forbes (1930–67) at Mayagüez and Ponce. While the curiously marked larvae doubtless would feed on the leaves of cultivated grape, they have not been found on it. Sometimes the adults by flight reach southern Canada and Patagonia. The caterpillars have "side patches very broad when young, (later) fusing into a broad vague pale shade, with only a little oblique mottling," according to Prof. Forbes.

Pholus vitis vitis (Linnaeus) is listed from Puerto Rico by all the early entomologists, Dr. Gundlach noting "la oruga se cría en *Cissus* (*Vitis*) *sicyoides.*" Its larvae have not been found since locally, but adults, with pink only on the anal angle of the hindwing, have been noted at light at

Río Piedras and Mayagüez, and intercepted at Bayamón, and doubtless occur in all the more humid parts of the Island.

Xylophanes chiron (Drury) var. **nechus** (Cramer) was listed from Puerto Rico by Drs. Stahl and Dewitz as *Choerocampa nechus* Cramer, and by Herr Möschler and Dr. Gundlach as *Chaerocampa chiron* (Drury). The only recent collection, as identified by Mr. B. Preston Clark, was at light at Río Piedras, February 15, 1916, by Mr. E. G. Smyth, who described it as a "handsome green sphinx moth; primaries olive green with brown markings; secondaries rich brown with row of six pale yellow spots; body green with three brown spots on thorax and yellow-brown sides of abdomen." Prof. Forbes (1930–68) notes that the caterpillar has "red subdorsal ocelli on first two segments of abdomen and a yellow one on third; feeding on several Rubiaceae."

Xylophanes pluto (Fabricius) was listed from Puerto Rico by Dr. Dewitz as *Pergesa thorates* Hübner and by Herr Möschler and Dr. Gundlach as *Pergesa pluto*, the latter noting "la oruga se cría en *Erythroxylon*." To this, Prof. Forbes (1930–69) adds that the caterpillar has "the usual eye-spot on the first abdominal segment"; the adult with "green fore wings and yellow-centered hind wings." The most recent record of collection is by Mr. G. Navarrete, November 1, 1912, at light at Río Piedras.

Xylophanes tersa (Linnaeus) was listed from Puerto Rico by all the early entomologists as a *Chaerocampa*, and is in Van Zwaluwenburg's list as P. R. 1415, Dr. Gundlach noting "la oruga se cría en *Spermacoce*." Later called *Mitracarpus portoricensis*, this plant is now known as *Borreria verticillata*, the "botoncillo" of which the nectar of the flowers is so attractive to the wasps of the changa parasite, *Larra americana*, as well as to honey bees. It is a common plant, and the sphinx caterpillars which feed on its leaves, and the sleek and slender adults which develop from them are similarly common. A similar common plant, *Diodia sarmentosa*, as identified by Mr. J. A. Stevenson, was found by him being eaten by these caterpillars at Mameyes in January 1915. They are green above, laterally barred with yellow, which becomes confluent dorsally into continuous stripes ending posteriorly in a pointed hump; each yellow stripe ornamented with seven eye-spots decreasing in size posteriorly, the anterior ones largest, most brightly colored and most elaborate. The dark brown hindwings of the adults have a series of bright yellow submarginal spots; the forewings are a light greenish-brown with somewhat darker stripes approaching the apex; the very tapering abdomen dorsally of the same color is laterally light yellow. Adults have been taken at light in all parts of the Island, Prof. Forbes (1930–68) listing Ponce and Naguabo, and (1931–345) Vieques Island.

Celerio lineata lineata (Fabricius) was listed from Puerto Rico by Drs. Stahl and Dewitz as a *Deilephila*, and by Herr Möschler and Dr. Gundlach as *D. daucus* Fabricius, the latter noting "he cogido las orugas en *Oenothera* de los jardines, en *Claytonia perfoliata* y en *Boerhaavea.*" This is P. R. 1424 in Van Zwaluwenburg's list. Altho sometimes found at light along the north coast, this is primarily a xerophytic or semi-xerophytic species, with many records from the south coast and from Mona Island. Prof. Forbes (1930–70) describes the caterpillars as "highly variable, green with red- or yellow-centered ocelli, or checkered with black and green, or largely black, with yellow dots in patches; head yellow, without black stripe across the mouth." No natural enemies have been noted in Puerto Rico, but in Hispaniola, the crows devour enormous numbers of these caterpillars, when they appear as outbreaks feeding on the weeds of *Boerhaavea* in cultivated fields. The wings of adults are often found in caves in Haiti frequented by insectivorous bats, but none of these or any other sphinx moth has been noted in bat caves in Puerto Rico. The forewings are brownish, with a broad light stripe extending from base to apex; the hindwings at base and marginally are dark brown, but the median area is bright pink.

Geometridae: Loopers or Measuring Worms

Dr. Wm. Schaus in his paper on the "Moths of the Families Geometridae and Pyralididae (Scientific Survey of Porto Rico and the Virgin Islands, **12** (3): 291–417. New York Academy of Sciences, New York, July 15, 1940) has provided a most modern systematic basis for the arrangement of biological data on these two families of moths. In the case of the Geometridae, this is rather insignificant in amount, for comparatively few rearings have been made, and indeed not much collecting of adults has been made in recent years. Dr. Schaus is continually in doubt as to the identity of many of these moths identified or described from Puerto Rico by Herr Möschler for this very reason; a condition which was finally resolved when the collections of the American Museum of Natural History in New York, and those of Cornell University made by Prof. Wm. T. M. Forbes, were available for his studies.

Ametris nitocris (Cramer) was listed from Puerto Rico as a *Mecoceras* by Herr Möschler and Dr. Gündlach. The MAC collection at Mayagüez contains specimens of local origin thus identified.

Almodes terraria Guenée, originally described from Haiti, and quite common in Cuba, is considered by Dr. Schaus (1940–292) to be what Dr. Gundlach collected in Puerto Rico, rather than the *Boarmia squamigera* Felder, a South America species, which was the identification given by Herr Möschler. Prof. J. A. Ramos (1947–47) found these moths, as identi-

fied by Prof. Wm. T. M. Forbes, abundant at light at Sardinera Beach, Mona Island in the summer of 1944.

Semaeopus caecaria Hübner was listed as *Zonosoma occipitraria* H. S. from Puerto Rico by the early entomologists, and Dr. Schaus (1940–293) notes recent collection from the Island of Vieques.

Semaeopus malefidaria was described as a *Cnemodes* by Herr Heinrich B. Möschler (1890–241) from material collected in Puerto Rico by Dr. Gundlach. It has since been found at San Germán, and on the Island of Vieques, as noted by Dr. Schaus (1940–293).

Semaeopus perletaria was described as a *Cnemodes* by Herr Heinrich B. Möschler (1890–240) from Puerto Rican material collected by Dr. Gundlach. It has not since been found anywhere.

Asellodes fenestraria Guenée is a very beautiful pinkish-white moth with irregular transparent golden areas on both fore and hind wings, identified by Dr. Harrison G. Dyar as a *Hydratoscia*, and thus listed by Mr. R. H. Van Zwaluwenburg (1601): on *Genipa americana*. Its distinctive caterpillars, found eating the leaves of this host locally called "jagua," at Río Piedras in the summer of 1921, and in the summer of 1942 at El Verde, Río Grande, have a dark purplish-brown head and five large irregularly rectangular spots of this color on the anterior abdominal segments, alternating with areas of the ground color of dull green; small purplish spots on the second and third segments, and smaller purplish spots on the other segments. They are very active when disturbed, jumping up and down very rapidly. Dr. Gundlach did not find this moth in Puerto Rico, and it may be a rather recent immigrant. Its caterpillars have been noted on the same host at Belém do Pará, Brasil, and its known distribution includes Mexico and Cuba.

Pleuroprucha pyrrhularia was described as an *Apallacta* by Herr Heinrich B. Möschler (1890–242) from Puerto Rican material collected by Dr. Gundlach, but has not since been found anywhere.

Pleuroprucha yunkearia was described by Dr. Wm. Schaus (1940–295) from a single female from El Yunque, with a wing expanse of 11 mm., its wings "pale yellow with roseate suffusions."

Pleuroprucha asthenaria (Walker), previously identified by Dr. Schaus from a single little yellowish moth reared from a two-horned pupa on a cane leaf at Yauco as *Hemiptilota insulsaria* Guenée and thus listed in "Insectae Borinquenses" (1936–454), has since been recognized by him (1940–295) from Aguirre, Coamo and San Germán. Prof. Forbes notes of this moth that "when fresh it is a very delicate pale green with some white."

Pleuroprucha molitaria was described by Herr Heinrich B. Möschler (1890–238) from Puerto Rican material collected by Dr. Gundlach. It

has been intercepted at light at Bayamón, and Dr. Schaus (1940–295) lists collections at Coamo, Aibonito, Lares and San Germán. The specimens which Dr. Schaus returned to the Cornell University collection were labeled **rudimentaria** Guenée, with *molitaria* indicated as a synonym.

Acratodes intamiataria was described by Herr Heinrich B. Möschler (1890–241) as a *Syllexis* from Puerto Rican material collected by Dr. Gundlach. It has not since been found anywhere.

Acratodes oslinaria was described by Dr. Wm. Schaus (1940–296) from numerous specimens "allied to *intamiataria* (Möschler)" from Cataño, Aibonito, San Germán and Ensenada, showing slight variation, with a wing expanse of 12 mm., "body and wings white with a few scattered irrorations; the wings crossed by two very fine brownish lines."

Acratodes oblinataria was described by Herr Heinrich B. Möschler (1890–239) as a *Leptostales*, and was thus listed from Puerto Rico by Dr. Gundlach.

Acratodes praepeditaria was described as a *Leptostales* by Herr Heinrich B. Möschler (1890–239) from Puerto Rican material collected by Dr. Gundlach. Dr. Schaus (1940–296) recognizes as this species specimens from Aguirre.

Acratodes virgota (Schaus) is recognized by its describer (1940–296) from Coamo and Ensenada.

Scelolophia delectabilaria was described as a *Zonosoma* by Herr Heinrich B. Möschler (1890–236) from Puerto Rican material collected by Dr. Gundlach. More recent collections have been made at Cataño, Coamo, Aibonito and Mayagüez, according to Dr. Schaus (1940–297).

Scelolophia phorcaria (Guenée), listed as an *Acidalia* by Herr Möschler and Dr. Gundlach from Puerto Rico, is recognized by Dr. Schaus (1940–298) from Coamo and Aguirre, and from Vieques Island.

Scelolophia randaria was described by Dr. Wm. Schaus (1940–298) from a single male with a wing expanse of 14 mm., from Coamo, with "head, metathorax and abdomen above, purplish red; wings pale pinkish yellow, the markings light russet vinaceous."

Scelolophia terminata (Guenée) was re-described under the name of *Leptostales devolutaria* by Herr Heinrich B. Möschler (1890–239), and as *Leptostales insutaria* (1890–240) from Puerto Rican material collected by Dr. Gundlach. It has since been intercepted at light at Bayamón and at Río Piedras, and Dr. Schaus (1940–298) cites additional collections at Aibonito, Coamo, San Germán, and on Vieques Island.

Scopula canularia (Herrich-Schäffer), as identified by Dr. Schaus (1940–300), has been collected at Coamo.

Scopula eburneata (Guenée), listed as an *Acidalia* by Herr Möschler and

Dr. Gundlach from Puerto Rico, is considered by Dr. Schaus (1940–299) as "undoubtedly one of the unfortunate mislabelings in the Staudinger Collection."

Scopula fernaria was described by Dr. Wm. Schaus (1940–200) from a single female intercepted at Bayamón, others from Coamo, with a wing expanse of 16 mm., which has the "head, thorax and abdomen pale smoke grey; wings white, finely irrorated with dark scales; a black discal point on both wings." Mr. Francisco Seín subsequently collected this moth at Lares, and Prof. Forbes at San Germán.

Scopula innominata was described by Dr. Wm. Schaus (1940–299) as differing, "according to Möschler, from *chioneata* Herrich-Schäffer by the absence of terminal black points on wings; the costa of the fore wing below, blackish gray," the type from San Germán, others from Ensenada, Ponce, Aguirre, Cataño and La Sardinera. "This is the whitest of the very small local geometers, and probably is the one formerly reported as *eburneata*," according to Prof. Forbes.

Scopula laresaria was described by Dr. Wm. Schaus (1940–300) from a single male from Lares, others from Coamo and Vieques Island, with a wing expanse of 12 mm., "thorax and abdomen white, the latter with grayish suffusions; wings white with black discal points."

Scopula subquadrata (Guenée) was described as *Acidalia tortuosaria* by Herr Heinrich B. Möschler (1890–237) from Puerto Rican material collected by Dr. Gundlach. It has not since been found locally.

Scopula umbilicata (Fabricius) is recognized by Dr. Schaus (1940–299) from Coamo, Guayanilla and Isabela. Prof. Forbes collected it on Vieques Island and at Aguirre.

Tricentrogyna floridora was described by Dr. Wm. Schaus (1940–301) from a single male from El Yunque, with a wing expanse of 13 mm., with a "fore wing long and narrow, the apex curved; ground color yellowish white rather thickly irrorated with vinaceous cinnamon scales."

Tricentrogyna vinacea (Butler), originally described as a *Hyria* from Jamaica, was re-described under the name of *Acidalia opentularia* by Herr Heinrich B. Möschler (1890–237) from Puerto Rican material collected by Dr. Gundlach. It was found at Utuado by Dr. Wm. A. Hoffman, intercepted at San Juan and Bayamón, and Dr. Schaus (1940–301) lists additional collections at Lares and on El Yunque. Prof. Forbes notes that the male is "rose with yellow border, the female looks totally different, being yellow with rose spots and patches."

Lobocleta dativaria was described by Dr. Wm. Schaus (1940–303) from a female from Coamo, others from Haiti, with a wing expanse of 15 mm., "wings silvery white with scattered fine irrorations."

Lobocleta maricaria was described by Dr. Wm. Schaus (1940-303) from a male from Coamo with a wing expanse of 16 mm., "wings silvery white, underneath the basal half of the fore wing suffused with gray."

Lobocleta monogrammata (Guenée) was recognized by Dr. Schaus (1940–303) from a single specimen from Coamo.

Lobocleta mutuataria was described as a *Leptostales* by Herr Heinrich B. Möschler (1890–239) from Puerto Rican material collected by Dr. Gundlach, but it has not since been found locally.

Lobocleta perditaria (Walker) was re-described under the name of *Acidalia offendata* by Herr Heinrich B. Möschler (1890–238) from material collected in Puerto Rico by Dr. Gundlach. It is recognized by Dr. Schaus (1940–302): a specimen from Coamo.

Sterrha curvicauda was described by Dr. Wm. Schaus (1940–304) from a male from Coamo, others from San Germán and Lares, and from Haiti, with a wing expanse of 13 mm., "fore wing silvery gray suffused somewhat with lilacine."

Ptychopoda monata was described by Prof. Wm. T. M. Forbes (*in* Ramos 1947–47) from an abundance of badly rubbed material collected on Mona Island by Dr. Luis F. Martorell, Prof. J. A. Ramos and Mr. J. A. Ferrer, 1939 to 1944, with a wing expanse of 11–12 mm., "luteous," "distinguished by the contrasting ordinary lines." This is the same genus as *Sterrha* used by Dr. Schaus.

Sterrha placitaria was described by Dr. Wm. Schaus (1940–304) from a female from Coamo with a wing expanse of 12 mm., "head, thorax and abdomen pale olive gray, partly irrorated with dull brown, the abdomen with transverse dark lines; wings grayish white with minute brownish irrorations."

Racheospila cupedinaria Grote is recognized by Dr. Schaus (1940–306) from collections made on Vieques Island, and in Puerto Rico at Lares and San Germán. Prof. J. A. Ramos (1947–49) found a single specimen, as determined by Prof. Wm. T. M. Forbes, at light, Sardinera Beach, Mona Island.

Racheospila gerularia (Hübner) was listed as *Geometra ocellata* Stoll from Puerto Rico by Herr Möschler and Dr. Gundlach, but has not since been found locally.

Racheospila herbaria (Fabricius), re-described from Puerto Rico by Herr Möschler under the name of *Geometra attendaria* (1890–243), has not since been found locally.

Racheospila isolata Warren was described (Nov. Zool. **7:** 138. 1900) from Grenada and Puerto Rico.

Racheospila merlinaria was described by Dr. Wm. Schaus (1940–306) from a male from Vieques Island, others from Aibonito, Coamo, Manatí,

Río Piedras and Palmas Abajo (between Guayama and Jájome Alto, collected by Dr. Wm. A. Hoffman) and from San Germán, which has a wing expanse of 12 mm., wings, thorax and abdomen green, "shaft of antennae white."

Racheospila sanctae-crucis Prout is listed by Dr. Schaus (1940–305) from four Puerto Rican localities, and Prof. J. A. Ramos (1947–48) found it common on Mona Island.

Oöspila confundaria was described as a *Racheospila* by Herr Heinrich B. Möschler (1890–242) from material collected by Dr. Gundlach in Puerto Rico, but has not subsequently been found anywhere.

Phrudocentra centrifugaria (Herrich-Schäffer) was re-described from Puerto Rico by Herr Heinrich B. Möschler (1890–243) under the name of *Racheospila anomalaria*. Dr. Schaus identified as this species an unlabeled, faded green moth, beautifully mounted, and lists (1940–307) another from Lares.

Synchlora albicostaria (Herrich-Schäffer) as an *Eucrostis* is listed from Puerto Rico by all the early entomologists.

Synchlora frondaria Guenée is identified by Dr. Schaus (1940–308) from five Puerto Rican localities and from Vieques Island. It has been reared from larvae intercepted on "Tártago emético," at San Juan.

Chloropteryx paularia Möschler, originally described from Cuba and Jamaica, is identified by Dr. Schaus (1940–308) from Aguirre, Palmas Abajo (between Guayama and Jájome Alto), Jájome Alto, La Sardinera (Dorado), Coamo, San Germán and Ensenada, three of these collections having been made by Dr. Wm. A. Hoffman.

Phrygionis moeschleri Prout, listed by the early entomologists as *Eulepidotus cultraria* Hübner or *E. paradoxata* Guenée, is represented in recent collections by one specimen, which may be this species, or *P. polita* (Cramer) or *P. argentata* (Drury), all three of which names are listed by Herr Möschler and Dr. Gundlach as species of *Eulepidotus*.

Leuciris mysteriotis Prout is considered by Dr. Schaus (1940–310) what Herr Möschler and Dr. Gundlach report from Puerto Rico under the name of *Chrysocestis fimbriaria* Cramer.

Macaria adrasata (Snellen), originally described as a *Semiothisa* from Jamaica, is recognized by Dr. Schaus (1940–311) from Puerto Rico: one specimen from Coamo.

Macaria cellulata Herrich-Schäffer was listed as a *Semiothisa* from Puerto Rico by Herr Möschler and Dr. Gundlach. Dr. Schaus (1940–311) identifies as this species a specimen from San Germán.

Macaria diffusata Guenée is a "medium buff Geometrid" of which Mr. E. G. Smyth collected thirty specimens at light at Hda. Santa Rita, Guánica, during the summer and fall of 1913, identified by Dr. Harrison G. Dyar

as a *Semiothisa*. During the winter of 1915 he noted their larvae completely defoliating trees of "flamboyán" (*Delonix regia*) at Guánica, and in the summer of 1916 reared others to adult at Río Piedras. At that time, the latter specimens were returned by Dr. Schaus with the notation "*Semiothisa* sp., in Coll. unnamed," but he later (1940–312) identified specimens from Coamo and Ensenada. These are moths with a wing expanse of 22 mm., pale buff or slightly greenish yellow, the marginal areas of whose wings are slightly darker than the basal two-thirds.

Macaria everiata Guenée is identified by Dr. Schaus (1940–311): specimens from Coamo.

Macaria increta Walker was re-described as *M. bisignata* by Herr Heinrich B. Möschler (1890–248) from Puerto Rican material collected by Dr. Gundlach. It has not since been noted locally.

Macaria paelolata Guenée was re-described from Puerto Rico by Herr Heinrich B. Möschler (1890–248) under the name of *Semiothisa infimata*, and it is thus listed by Dr. Gundlach. Dr. Schaus has thus identified recently collected specimens from Coamo and Aguirre. Prof. Forbes found it on Vieques Island.

Macaria regulata (Fabricius) was re-described from Puerto Rican material collected by Dr. Gundlach under the name of *Semiothisa enotata* given by Herr Heinrich B. Möschler (1890–246). Dr. Schaus (1940–311) thus identifies subsequent collections at Coamo, Ponce and Ensenada. An unlabeled specimen, to which he had given Möschler's name, is creamy white, speckled with brown; hind wing strongly angled, forewing with anteapical brown band and spot. Another, which appears to be the same, was collected by Dr. Luis F. Martorell at Villalba.

Macaria trientata Herrich-Schäffer is identified by Dr. Schaus (1940–311) from Yauco.

Syrrhodia decrepitaria Hübner was listed as an *Acroleuca* from Puerto Rico by all the early entomologists, and Dr. Schaus (1940–312) identified a specimen from Coamo.

Numia terebintharia Guenée, listed from Puerto Rico by Herr Möschler and Dr. Gundlach, is identified by Dr. Schaus (1940–313): specimens from Ensenada and Coamo. Prof. J. A. Ramos (1947–49) collected several adults, as identified by Prof. Wm. T. M. Forbes, at light on Mona Island.

Cyclomia mopsaria Guenée, re-described from Puerto Rico by Herr Heinrich B. Möschler as *Cerasympiasta marsitata* (1890–261) and *C. sanata* (1890–262), is "an extremely variable species" according to Dr. Schaus (1940–314), who lists recent collections from Coamo and from Vieques Island.

Drepanodes infensata Guenée, altho listed by Herr Möschler and Dr. Gundlach from Puerto Rico, does not occur in any of the West Indies,

according to Dr. Schaus (1940–314) "and Möschler has probably misidentified the species." Prof. J. A. Ramos (1947–49) collected specimens at light, thus identified by Prof. Wm. T. M. Forbes, on Mona Island, which were *Halesa ephyrata* (Guenée), as redetermined by Prof. Forbes.

Möschleria hulstii Saalmüller (in Möschler 1890–235), the type from Puerto Rico, is listed by Dr. Gundlach, but no subsequent collection has been made.

Nepheloleuca complicata (Guenée), listed from Puerto Rico as a *Urapteryx* by Herr Möschler and Dr. Gundlach, has "a black point on angle of hind wing" according to Dr. Schaus (1940–135), who lists a recent specimen from Coamo.

Nepheloleuca politia (Cramer), listed from Puerto Rico as an *Urapteryx* by the early entomologists, is recognized by Dr. Schaus (1940–315): a pair from Coamo. This is a fine large sulfur yellow Geometrid, with a wing expanse of 48 mm., with minute dark spots and narrow cross-bars; poorly developed pinkish eye-spots on anal angles of both wings; similar semicircular pinkish area near apex of forewings and transverse submarginal band across hindwings.

Nepheloleuca illiturata (Guenée) is listed by Dr. Schaus (1940–315) from Puerto Rico: a Cuban species originally described as a *Urapteryx*.

Microgonia vesulia (Cramer), has a most misleading generic name, being possibly the largest Geometrid in Puerto Rico, some adults having a wing spread just short of three inches. Dr. Stahl lists it as *Oxydia quadriagliata* Guenée, and Herr Möschler and Dr. Gundlach used this generic name, the latter adding "estas especies varían muchísimo: Möschler describe diez variedades." In Van Zwaluwenburg's list it is P. R. 1450. Mr. E. G. Smyth collected six adults at light at Hda. Santa Rita, Guánica during the summer and fall of 1913, and they have repeatedly been intercepted at light at Bayamón. They are light yellowish-brown in color, with a darker stripe extending from the pointed and curved apex of the forewing to the middle of the inner margin of the hind wing. The caterpillar is a large grey looper, which, when at rest resembles a bare twig, being stiff and immobile, resting only on the anal prolegs. Mr. E. G. Smyth found one feeding on the ornamental *Acalypha wilkesiana* at Río Piedras, but apparently the caterpillars are not very particular as to host, for one has since been found feeding on the leaves of wild orange at Cayey, and one on cultivated rose at Aibonito, all of these having been reared to adult.

Sabulodes caberata Guenée, listed from Puerto Rico as *Microgonia dositheata* Guenée by Herr Möschler and Dr. Gundlach, is recognized by Dr. Schaus (1940–317): a specimen from Coamo.

Sabulodes exhonorata Guenée is listed by Dr. Schaus (1940–316) from Puerto Rico.

Pero rectisectaria Herrich-Schäffer was listed from Puerto Rico by all the early entomologists, Dr. Stahl using the name *Pero curvistrigaria* H. S.

Pero vetustaria (Walker) was identified by Dr. Schaus as an *Azelina*, as noted in "Insectae Borinquenses" (1936–452), and he notes (1940–317) another specimen from Coamo.

Apicia alteraria Guenée, listed as *Apicia distycharia* Guenée from Puerto Rico by Herr Möschler and Dr. Gundlach, does not occur in the West Indies, according to Dr. Schaus (1940–318), who believes "it is another case of wrong locality in the Staudinger Collection."

Gonorthus vestalis (Hulst), listed from Puerto Rico as *Sericoptera area* Cramer by Herr Möschler and Dr. Gundlach, has not since been found locally.

Halesa epionata (Guenée) is identified by Dr. Schaus (1940–319) from Puerto Rico: a specimen from Coamo.

Halesa ephyrata (Guenée), listed from Puerto Rico as a *Drepanodes* by Herr Möschler and Dr. Gundlach, is apparently quite common, Dr. Schaus (1940–319) noting collections at Ensenada, San Germán, Coamo, Aguirre and Palmas Abajo. It was this moth which Prof. J. A. Ramos (1947–49) collected at light on Mona Island, misidentified as *Drepanodes infensata* Guenée.

Sphacelodes vulneraria (Hübner) is listed as a *Brothis* from Puerto Rico by Herr Möschler and Dr. Gundlach, but has not since been found locally.

Thysanopyga apicitruncaria Herrich-Schäffer is listed from Puerto Rico by Herr Möschler and Dr. Gundlach, and Dr. Schaus (1940–320) records collection at Coamo.

Thysanopyga nicetaria (Guenée), originally described as a *Psamatodes* from Haiti, is identified by Dr. Schaus (1940–320) from Puerto Rico; a specimen from Coamo. He considers *T. subpusaria* (H. S.), listed from Puerto Rico by Herr Möschler and Dr. Gundlach under the generic name of *Stegania*, to be a probable synonym. Prof. Forbes, examining his specimens from Coamo Springs, is of the opinion "that they are more probably *cyclata* (Walker 1862–1669), originally described from Santo Domingo as *Fidonia*."

Leucula simplicaria (Guenée), listed from Puerto Rico as a *Bombycodes* by Herr Möschler and Dr. Gundlach, has not since been found locally.

Bronchelia detexta Walker was listed from Puerto Rico as *Boarmia pudicaria* Guenée by the early entomologists, and Herr Möschler identified another "female with underside of hind wing ocher yellow" as *Boarmia scolopacea* Drury. Dr. Schaus (1940–322) is of the opinion that "these determinations are all wrong."

Iridopsis delicata (Butler) was listed from Puerto Rico as a *Boarmia*

by Herr Möschler and Dr. Gundlach, but no specimen has since been found locally.

Iridopsis momaria (Guenée), listed as a *Boarmia* from Puerto Rico by Herr Möschler and Dr. Gundlach, as which Dr. Schaus identified a specimen as an *Alcis*, reported in "Insectae Borinquenses" (1936-452), "does not agree with Guenée's excellent figure" according to Dr. Schaus (1940-323).

Iridopsis hilararia was described by Herr Heinrich B. Möschler (1890-266) from Puerto Rican material collected by Dr. Gundlach, and thus listed by him, but has not since been found anywhere.

Iridopsis idonearia (Walker) was listed from Puerto Rico as *Boarmia objectaria* H. S. by Herr Möschler and Dr. Gundlach, and Dr. Schaus (1940-323) lists subsequent collections at Ensenada, Coamo and Aguirre.

Thyrinteina arnobia (Cramer), listed from Puerto Rico as *T. quadricostaria* H. S. by Herr Möschler and Dr. Gundlach, has not since been found locally.

Scordylia quadruplicaria (Hübner), listed from Puerto Rico by Herr Möschler and Dr. Gundlach, does not occur in the West Indies, according to Dr. Schaus (1940-324).

Melanchroia cephise (Stoll) was not listed from Puerto Rico by any of the early entomologists, the first record being in Van Zwaluwenburg's list as number 1663: on *Phyllanthus lathyroides*, and in his account, Mayagüez Station Report for 1914 (1916-31) of "a local outbreak at Camuy, where the larvae practically stripped the grosella trees, *Phyllanthus distichus*." At the same time, Mr. Thos. H. Jones noted an outbreak at Río Piedras, and two years later, in the summer of 1916, Mr. E. G. Smyth a comparable one on "grocella" or "cereza amarilla" (*Cicca disticha*). The dark adults, their rounded wings apically margined with cream, plumed antennae and chestnut collar, were first noted on weeds in cane fields at Río Piedras in January 1912, and have since been seen repeatedly on flowers of "botoncillo" (*Borreria verticillata*), most recently at Yabucoa in 1939. The moths rarely come to light, but have been intercepted at Bayamón and at Peñuelas, and are presumably present in all parts of the Island, despite the scarcity of records in recent years.

Hammaptera chloronotata was described by Herr Heinrich B. Möschler (1890-273) from Puerto Rican material collected by Dr. Gundlach. Dr. Schaus (1940-325) lists a recent collection from Utuado.

Hammaptera moeraria (Guenée) is listed by Dr. Schaus (1940-325) from Puerto Rico.

Hammaptera vinaceata was described as a *Cidaria* by Herr Heinrich B. Möschler (1890-273) from Puerto Rican material collected by Dr. Gundlach, but has not since been found anywhere.

Pterocypha praecurraria was described as a *Spargania* by Herr Heinrich B. Möschler (1890-269) from Puerto Rico, and thus listed by Dr. Gundlach. Dr. Schaus (1940-326) recognizes as this species a specimen from Adjuntas.

Pterocypha defensata Walker, as determined by Dr. Schaus, was collected by Mr. E. G. Smyth at light, Hda. Santa Rita, Guánica, on October 2nd., November 19th. and 26th., 1913. Dr. Schaus (1940-326) notes an additional collection at San Germán. This is a greyish moth, its rounded wings with darker wavy lines, a dark spot at base and apex of forewings, a wing expanse of 30 mm.

Camptolina stellata (Guenée) was listed as *Cidaria balteolata* H. S. from Puerto Rico by Herr Möschler and Dr. Gundlach, and as a *Larentia* by Dr. Stahl. Recent collections identified by Dr. Schaus (1940-327) have been made at Coamo and Aguirre, and on Vieques Island.

Rhopalodes castniata Guenée, altho listed from Puerto Rico by Herr Möschler and Dr. Gundlach, is a Brasilian species, according to Dr. Schaus (1940-327), to which the wrong locality label was attached in the Staudinger Collection.

Graphidius aureocapitaria was described as a *Terenodes* by Herr Heinrich B. Möschler (1890-274) from Puerto Rican material collected by Dr. Gundlach, but it has not since been found anywhere. Dr. Stahl has the name *Terenodes mirandilis*.

Cambogia snellenaria was described as an *Asthena* by Herr Möschler, are listed by him and Dr. Gundlach from Puerto Rico, but has not since been found locally.

Epiplemidae

Nedusia excavata was described by Herr Heinrich B. Möschler (1890-244) from Puerto Rican material collected by Dr. Gundlach, and thus listed by him. The adult is "ash gray, with dark brown markings, the median line of the hind wing whitish, edged with dark brown, and bent at a right angle" according to Prof. Forbes (1930-71), who records a recent collection at Coamo, and (1931-345) at Jájome Alto.

Syngria ramosaria and **Syngria reticularia** were described by Herr Heinrich B. Möschler (1890-256) from Puerto Rican material collected by Dr. Gundlach, and listed by him, but neither has since been found anywhere.

Epiplema ecludaria and **Epiplema obvallataria** were described as belonging in genus *Erosia* by Herr Heinrich B. Möschler (1890-262 and 263) from Puerto Rican material collected by Dr. Gundlach, and thus listed by him. Neither has since been found locally.

Epiplema ineptaria was described by Herr Heinrich B. Möschler (1890-262) as an *Erosia* from Puerto Rico, and it is thus listed by Dr. Gundlach.

Prof. Forbes identifies (1930-72) as this species specimens collected at Coamo and San Germán.

Letchena myreusalis Walker, as identified by Dr. Wm. Schaus, was intercepted at light at Bayamón.

Pyralidae or Pyralididae: Snout Moths, Webworms, Leaf-Folders and Leaf-Tiers

Practically all of the new rearing and host records in this section are due to Dr. Luis F. Martorell, many of these being first reported by him in "Some Notes on Forest Entomology" (Caribbean Forester, **1** (2): 25–26, 1 (2): 31–32, **1** (3): 23–24, **2** (2): 80–82. New Orleans, October 1939, January and April 1940, and January 1941). These observations, and others made by him in succeeding years, formed the field work for his doctorate thesis, "A Survey of the Forest Insects of Puerto Rico" (Jour. Agr. Univ. P. R., **29** (3 and 4, July and October 1945): 69–608, fig. 18, pl. 21. Río Piedras, September 30, 1948), interminably delayed in publication and unfortunately not available for consultation until after this section had been written. It may be presumed, therefore, that all records of leaf-folders and leaf-tiers attacking forest trees, here reported as having been made by Dr. Martorell, were previously recorded in this thesis.

Subfamily Glaphyriinae

Glaphyria badierana (Fabricius) is listed as a *Homophysa* by Dr. Schaus (1940–329) from Coamo in Puerto Rico, and from Vieques Island. The Cornell University collection contains specimens, as identified by Prof. Forbes, collected by Dr. M. D. Leonárd at Aguirre, by Dr. W. A. Hoffman in Santurce and by Mr. Francisco Seín at Lares.

Glaphyria dolatalis was described by Herr Heinrich B. Möschler (1890-321) from Puerto Rican material collected by Dr. Gundlach, and listed by him. Adults have repeatedly been intercepted at light at Bayamón, and Dr. W. A. Hoffman found it at Utuado and at El Semil. Dr. Schaus (1940-330) notes that "this species is much more abundant than *H. badierana* (Fabricius)," and lists additional collections from Aguirre, Coamo, San Germán, Lares and El Yunque, as well as from the Islands of Vieques and Culebra.

Symphysa amoenalis (Walker) is identified by Dr. Schaus (1940-331) from Puerto Rico: two specimens from Coamo.

Lipocosma hebescalis was described by Herr Heinrich B. Möschler (1890-316) from Puerto Rican material collected by Dr. Gundlach, and listed by him. Adults have been intercepted at light at Bayamón, and Dr. Schaus (1940-331) lists additional collection on El Yunque.

Lipocosma metalophota (Hampson) is recognized by Dr. Schaus (1940-331) from Puerto Rico: adults collected by Dr. W. A. Hoffman at La Sardinera, Dorado.

Lipocosma savoralis Schaus, originally described from Cuba, also occurs in Puerto Rico according to the describer (1940-331), recognizing an adult from Lares.

Dicymolomia pegasalis (Walker); as identified by Mr. Carl Heinrich, was intercepted on "roble" (*Tabebuia pallida*) at San Juan.

Chalcoëla discedalis was described by Herr Heinrich B. Möschler (1890-320) from two males and a female collected in Puerto Rico by Dr. Gundlach, and listed by him. Dr. Schaus (1940-402) lists later collections at Manatí and Lares, and from Vieques Island. Prof. Forbes suggests a generic transfer to *Dicymolomia*.

Subfamily Pyraustinae

Hymenia recurvalis (Fabricius) was listed as a *Zinckenia* from Puerto Rico by all the early entomologists, Dr. Gundlach noting "la oruga se cría en *Amaranthus y Celosia*." As **Zinckenia fascialis** (Cramer) it is in Van Zwaluwenburg's list; Mr. Thos. H. Jones (1915–8) notes its larvae feeding on *Amaranthus*, and Dr. Richard T. Cotton (1918–8) as "webbing and skeletonizing the leaves of beets." Dr. M. D. Leonard (1932–115) under the generic name of *Hymenia*, records collecting adults at light at Aguirre, and finding larvae on beets and Swiss chard at Palo Seco, and on *Gomphrena dispersa*. During the summer, fall and early winter of 1913, Mr. E. G. Smyth collected eighty-six of these "spotted brown Pyraustids" at light, Hda. Santa Rita, Guánica, they being possibly more abundant than any other moth found at that time. It has also been taken at light at Río Piedras, and repeatedly intercepted at Bayamón, being, as Dr. Schaus (1940–332) notes, "almost universally distributed," with collections from seven additional localities in Puerto Rico as well as in Vieques Island. The collar and posterior margin of the abdominal segments are white, as is also a broad band halving both golden-brown wings, and a shorter band on the forewings half-way towards the apex.

Hymenia perspectalis (Hübner) has much narrower, wavy white bands on its brown wings. It was listed from Puerto Rico by Dr. Gundlach, without any note as to the host plants of the larvae, but Herr Möschler states "Raupe nach Guenée am Lilium canadense, Burg vermutet sie an Cestrum parque und an Saplichroa rhomboida." Dr. E. G. Smyth reared larvae at Río Piedras on *Synedrella nodiflora*, *Eleutheranthera ruderalis*, *Wedelia trilobata*, *Verbesina alba* and *Melanthera canescens*, having previously collected seventy-five adults, as determined by Dr. Harrison G. Dyar, at light at Hda. Santa Rita, Guánica, during the latter half of 1913.

Pycnarmon receptalis (Walker) is listed from Puerto Rico by Herr Möschler and Dr. Gundlach under the name *Spilomela personalis* H. S., but has not since found locally.

Desmia naclialis Snellen, listed from Puerto Rico by Herr Möschler and Dr. Gundlach, has been collected by Dr. W. A. Hoffman at El Semil, determined as "probably" by Mr. Carl Heinrich.

Desmia recurvalis was described by Dr. Schaus (1940-334), the type specimen from Cuba, a battered one from Puerto Rico, with a wing expanse of 27 mm., mostly "sepia" in color, with white markings.

Desmia stenizonalis Hampson is listed by Dr. Schaus (1940-334) from Puerto Rico.

Desmia tages (Cramer) is listed from Puerto Rico under this name by Dr. Stahl, and as *Desmia sertorialis* H. S. by Herr Möschler and Dr. Gundlach. It is identified by Dr. Schaus from five Puerto Rican localities.

Desmia ufeus (Cramer) was listed from Puerto Rico as *Desmia orbalis* Guenée and re-described by Herr Heinrich B. Möschler (1890-311) under the name of *Desmia viduatalis*; and under both these names, not in synonymy, listed by Dr. Gundlach. The irregular, iridescent white bands on its wings are so extensive as sometimes to cover more than half of their area. Mr. J. D. More reared to adult some larvae feeding on the leaves of the wild grape, "bejuco de caro" (*Cissus sicyoides*) at Río Piedras, finding some of them parasitized by *Apanteles ruficollis* (Cameron), as identified by Mr. C. F. W. Muesebeck. Mr. Carl Heinrich identified adults collected at El Semil by Dr. W. A. Hoffman, and Dr. Schaus (1940-332) lists collections at Aguas Claras (Fajardo), Manatí, Cayey, Aibonito and San Germán. Prof. Forbes found it on Vieques Island.

Synclera traducalis (Zeller) was listed from Puerto Rico by Herr Möschler and Dr. Gundlach. Twenty-four adults of this "white and brown Pyraustid," as idenified by Dr. Harrison G. Dyar, were collected by Mr. E. G. Smyth at light at Hda. Santa Rita, Guánica, during the latter half of 1913. It has been intercepted at Bayamón, and Dr. Schaus (1940-335) lists additional collections at San Germán, Coamo, Manatí, Lares, and Guayama. The adult is more white than brown, its wings having oval or irregular-shaped white areas bounded by narrow brown lines.

Ercta vittata (Fabricius) was re-described by Herr Heinrich B. Möschler (1890-302) from Puerto Rican material collected by Dr. Gundlach under the name of *Euclasta torquillalis*. Mr. E. G. Smyth collected eight adults of this "small buff-brown Pyralid" at light at Hda. Santa Rita, Guánica, during the latter half of 1913, and Dr. Schaus (1940-336) lists additional collections at San Germán and Guayama, and on Vieques Island. It has been intercepted once at San Juan. The legs and the posterior half of the

forewings are cream in color, the anterior half is dark brown, with small black spots along the margin.

Marasmia cochrusalis (Walker) was re-described by Herr Heinrich B. Möschler (1890-293) from Puerto Rican material collected by Dr. Gundlach under the name of *Cnaphalocrocis perpersalis*. Mr. Francisco Seín reared adults from corn leaves; the delicate whitish moths have been intercepted at light at Coamo and on Vieques Island. The eyes of this moth are black; the fore margin of the fore wing is light brown, as are also narrow submarginal and marginal bands, and three bands on the hind wings, but otherwise it is whitish.

Marasmia similis (von Hedemann), originally described as a *Cnaphalocrocis* from St. Croix of the Virgin Islands, was first noted economically as "A Pyralid-Pyraustinid larva attacking the Leaves of Sugar-Cane in Hispaniola" (Jour. Ec. Ent., **18** (2): 422. Geneva, April 1925). "*Marasmia trapezalis* Guenée on Sugar-Cane only in Hispaniola and Perú of the Western Hemisphere" (Jour. Ec. Ent., **22** (1): 268–9. Geneva, February 1929) records a further extension of its range. In "The Seasonal Cycle of Insect Abundance in Puerto Rican Cane Fields" (Jour. Agr. Univ. P. R., **27** (2, April 1943): 85–104, fig. 12, ref. 16. Río Piedras, June 1944), it is noted as a leaf-tier which feeds on the tips of the leaves of young cane, "ruining the appearance of young fields, but at present of no economic importance in Puerto Rico because of its scarcity. The first record of this insect in Puerto Rico was at Barrio Camaseyes, Aguadilla, in July 1931, a single caterpillar only in a large cane field. Reared to adult, it was determined by the late Dr. William Schaus as *M. similis* von Hedemann. The type of *M. similis* is from St. Croix, but in economic literature it has not been recorded from there as a pest of sugar cane. Mr. Carl Heinrich states that the specimen identified by Dr. Schaus 'agrees in all details with typical *trapezalis*,' altho it is considerably darker and richer in color. "Our records in Puerto Rico would appear to indicate its recent arrival from Hispaniola: very abundant in Barrio Aguacate, Aguadilla in October 1936, as well as in another field near Camuy; also very abundant in two fields at Guánica in November 1939, and in a field at Yauco in December 1936, and in one at Sabana Grande in the same months in 1937. The only other record of its presence is in July 1937 at Guayanilla. All of these localities are on or near the west coast of Puerto Rico, closest to Hispaniola."

Marasmia trapezalis (Guenée) is noted by Dr. Schaus (1940-337) as being "widely distributed," definitely recorded from Vieques and from Cuba. If present in Cuba, it has not been noted as occurring on sugar-cane. Adults intercepted at light at Bayamón have been identified by Dr. Schaus as this species. The most recent record is of a very light colored adult, reared from leaves of sugar-cane at Río Piedras, growing in the Station

greenhouse, found in May 1944. All specimens are similar in the brownish costal and outer margins of the fore wing, and the pattern of one entire and two interrupted darker brown bands, but vary considerably in depth of coloration. On the assumption that Mr. Carl Heinrich is correct in his synonymy, all of the records under *M. similis* (von Hedemann) described in 1894 are to be assigned to *M. trapezalis* (Guenée) described in 1854.

Syngamia cassidalis (Guenée) was re-described by Herr Heinrich B. Möschler (1890-291) from Puerto Rican material collected by Dr. Gundlach under the name of *Salbia praeformatalis*. It has been intercepted at light at Bayamón, and Dr. Schaus (1940-337) records collection at Coamo.

Syngamia cognatalis (Snellen) was listed as a *Salbia* from Puerto Rico by Herr Möschler and Dr. Gundlach. The Cornell University collection contains a series of specimens labeled "*Marasmia conflictalis* Schs." including one labeled "cotype" from Lares collected by Mr. Francisco Seín, others from Maricao, Coamo, Ćayey and El Yunque. Prof. Forbes thinks these were not described by Dr. Schaus, but probably represent what Herr Möschler and Dr. Gundlach report under the name of *cognatalis*.

Syngamia florella (Cramer) was listed from Puerto Rico by all the early entomologists. It is a very distinctive little brownish moth, with three large golden yellow spots on the fore wing, two on the hind wing, and an orange-yellow abdomen. It has an extensive distribution in tropical America, according to Dr. Schaus (1940-338), who lists it from nine Puerto Rican localities in the more humid and mountainous parts of the Island from El Yunque to Mayagüez. An adult was intercepted on ñame at Isabela, which may indicate the host plant of the caterpillar.

Syngamia haemorrhoidalis (Guenée) was listed from Puerto Rico by Herr Möschler and Dr. Gundlach, and Dr. Schaus (1940-338) notes subsequent collection at San Germán, Lares, Aibonito and Coamo.

Syngamia varanalis was described by Dr. Wm. Schaus (1940-338), the type from Coamo, with a wing expanse of 19 mm., the head, front of collar, patagia and base of abdomen white; fore wing white, the lines black.

Hileithia ductalis was described by Herr Heinrich B. Möschler (1890-292) from Puerto Rican material collected by Dr. Gundlach. It has been repeatedly intercepted at light at Bayamón. Dr. W. A. Hoffman collected adults at Utuado, and Dr. Schaus (1940-339) records additional collections from El Yunque, Río Piedras, Coamo and Mayagüez.

Samea carettalis was described by Dr. Wm. Schaus (1940-340), the type from Jamaica, others from San Germán, Maricao, Lares, Aibonito, Jájome Alto and El Yunque in Puerto Rico, both sexes having a wing expanse of 18 mm. The sexes of this mountainous species differ considerably, only the fore wings being similar in markings.

Samea ecclesialis Guenée was listed from Puerto Rico by all the early

entomologists, thus or as *Samea castellalis* Guenée. It has repeatedly been intercepted at light at Bayamón, and Dr. Schaus (1940-339) lists nine other localities of collection in the more humid parts of the Island. Broad and narrow brown bands alternate with iridescent clear areas on the fore wings.

Samea mictalis Hampson is identified by Dr. Schaus (1940-339) from Coamo and Arecibo.

Samea multuplicalis Guenée, as identified by Prof. Wm. T. M. Forbes, was found by Prof. J. A. Ramos (1947-49) abundant at light in April 1944 on Sardinera Beach, Mona Island.

Trithyris quadrifenestralis (Herrich-Schäffer) was listed from Puerto Rico as a *Coenostola* by Herr Möschler and Dr. Gundlach, but has not since been found locally.

Bocchoris differentialis Dyar, as identified by Mr. Carl Heinrich, was collected at light at El Semil, Villalba by Dr. W. A. Hoffman.

Pilocrocis delimitalis (Guenée), re-described from Puerto Rico as *Ceratoclasis metatalis* by Herr Heinrich B. Möschler (1890-307) from two males in the Krug collection, and a female in that of Dr. Staudinger, and thus listed by Dr. Gundlach, is recognized by Dr. Schaus (1940–342): a series from Coamo, collected by Prof. Forbes.

Pilocrocis dryalis (Walker), as determined by Mr. Carl Heinrich, was collected by Dr. W. A. Hoffman at El Semil, Villalba, on May 10th, 1941.

Pilocrocis hesperialis (Herrich-Schäffer), originally described from Cuba and quite common there, is recognized by Dr. Schaus (1940-342) from Puerto Rico: a specimen from Aguirre.

Pilocrocis infuscalis (Guenee) was listed from Puerto Rico as *Botys pruinalis* Lederer by Herr Möschler and Dr. Gundlach. Dr. Schaus (1940-343) notes a more recent collection, from Coamo.

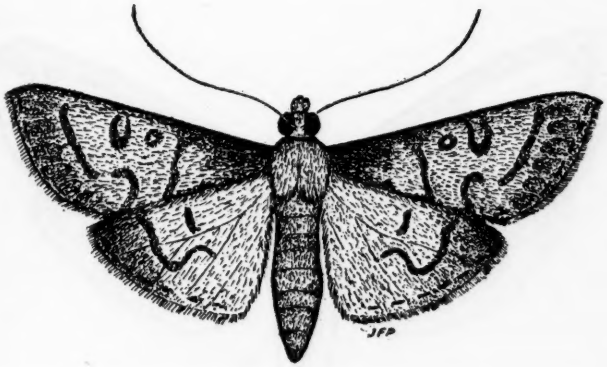
Pilocrocis "presumably *inguinalis* (Guenée) but somewhat abnormal" as identified by Mr. Carl Heinrich, is called the "higüerillo leaf-webber" by Dr. Luis F. Martorell, who found the larvae causing heavy defoliation of *Vitex divaricata* at Cayey in January 1941. It is a pale yellowish moth, with three narrow wavy and somewhat interrupted bands on the fore wing, and two on the hind wing.

Pilocrocis lauralis (Walker) was listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Spilomela pervialis* H. S. It has been intercepted at light at Bayamón, and Dr. Schaus (1940-342) notes collection at Coamo. It is quite common on Mona Island, having been collected at light at Camp Kofresí by Dr. Luis F. Martorell in August 1939, with identification by Mr. Carl Heinrich, and at the same locality by Prof. J. A. Ramos, (1947-49) in March 1944. The brown bands on both fore and hind wings are arranged as somewhat distorted Ws.

Pilocrocis pertentalis was described by Herr Heinrich B. Möschler (1890-284) as a *Botys*, and thus listed by Dr. Gundlach, who had several specimens of both sexes from Puerto Rico. Dr. Schaus (1940-343) notes subsequent collection at Ensenada and on Vieques Island.

Pilocrocis ramentalis Lederer is recognized by Dr. Schaus (1940-343) from Puerto Rico: a specimen from Coamo.

Pilocrocis secernalis was described from Puerto Rico as a *Botys* by Herr Heinrich B. Möschler, and is thus listed by Dr. Gundlach. Dr. Schaus (1940-343) records collection from San Juan and San Germán.



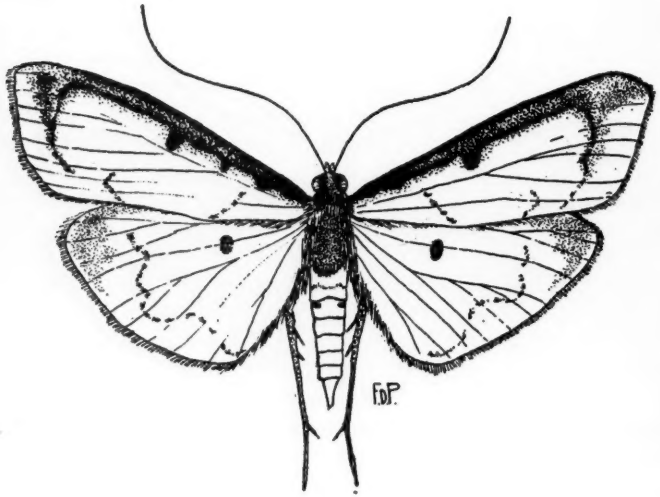
Adult of the Capá Blanco Leaf-Webber, *Pilocrocis secernalis* (Möschler), four times natural size. (Drawn by José F. Pietri.)

It is an inconspicuous little brownish moth with three darker bands on the fore wing, of which Dr. Luis F. Martorell reared numerous adults, as identified by Mr. Carl Heinrich, from caterpillars defoliating trees of "capá blanco" (*Petitia domingensis*) in November and December 1940 at Aguas Buenas and San Sebastián.

Pilocrocis tripunctata (Fabricius) was listed from Puerto Rico by all the early entomologists as *Acrospila campalis* Guenée. Mr. Thos. H. Jones (1915-9) found "sweet potato leaves webbed together and injured by the larva" and illustrated the adult. Mr. E. G. Smyth found larvae on what was at that time identified as *Ipomoea bonanox*: "bejuco de vaca" (*Calonyction aculeatum*). Adults have been repeatedly taken at light at Bayamón, and Dr. Schaus (1940-343) records collections at Coamo and Guayama. The adult is a yellowish moth with a wing expanse of 25 mm., a prominent brown spot near the costal margin of the hind wing, another less well

marked at the apex. The forewing has several brown spots along the costal margin, of varying size and intensity.

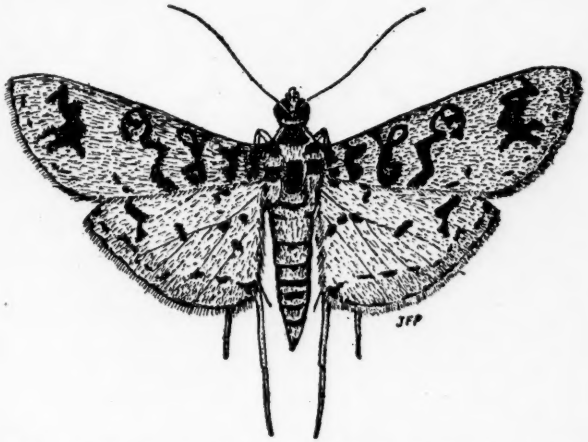
Mesocondyla concordalis (Hübner), most recently re-placed in the genus **Eulepte,** in which it was originally described, was listed from Puerto Rico by Herr Möschler and Dr. Gundlach as an *Acrospila*, and as *Acrospila gastralis* Guenée, with no note as to the host plant of the larva. The injury to the foliage of the calabash tree or "higüero" (*Crescentia cujete*) is often conspicuous, but the caterpillars may also attack that of the "roble"



Adult of the Roble Leaf-Webber, *Eulepte concordalis* Hübner, three times natural size. (Drawn by Francisco D. Palacios Comelin.)

(*Tecoma pentaphylla* or *Tabebuia pallida*), the "roble de sierra" (*Tabebuia rigida* and *T. argentea*), the "higüerillo" (*Enallagma latifolia*), as well as of one tree not present in Puerto Rico at the time of Gundlach's visits: the imported African tulip tree or "tulipán" (*Spathodea campanulata*). All of these trees belong to the family of the Bignoniaceas, the caterpillars by their choice of food plants, or the female moths by their selection of trees on which to oviposit, confirming the opinion of the botanists as to their essential similarity. Mr. E. G. Smyth collected at light at Hda. Santa Rita, Guánica, during the latter half of 1913, eighteen of these "fancy yellow Pyralids," and they are often quite common at light in the mountains or in the more humid parts of the Island. Dr. Schaus (1940-344) notes collection at Lares and on El Yunque, as well as on Vieques Island.

Prof. J. A. Ramos (1947-49) collected "numerous adults of the pale variety (det. W. T. M. Forbes), Sardinera Beach" on Mona Island, confirming the observation of Dr. Luis F. Martorell, who had noted the larvae attacking the leaves of *Tabebuia heterophylla* and *T. lucida* on the plateau of Mona. The costal margin of the fore wing of these pale iridescent yellow moths is brown, broadening towards the apex and extending down on the outer margin; the hind wing has prominent (or sometimes only traces of) two brown spots. The caterpillars are attacked by the Tachinid fly, *Sturmia albincisa* (Wiedemann), by the Chalcid wasp, *Bracymeria incerta* (Cresson). Dr. Luis F. Martorell, in his "Notes on the Biology of *Mesocondyla concordalis* Hübner, and its Parasites" (Caribbean Forester, **2** (1): 18–19,



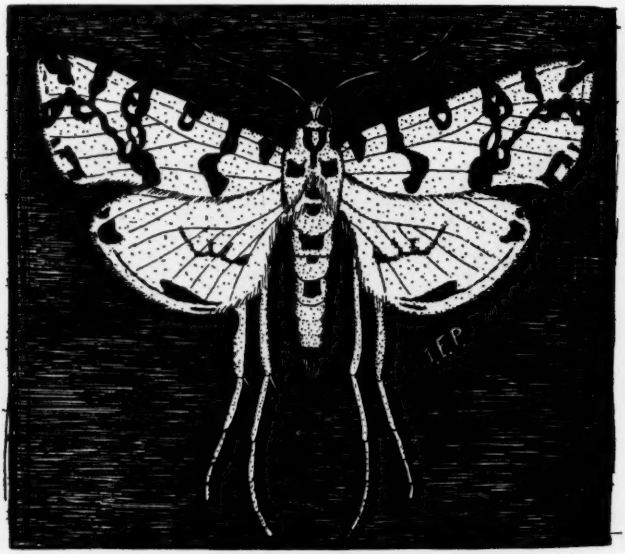
Adult of the Colubrina Leaf-Roller, *Spilomela fimbriauralis* (Guenée), about twice natural size. (Drawn by José F. Pietri.)

fig. 1. New Orleans, October 1940), records rearing another Braconid wasp, *Microbracon cushmani* Muesebeck, from larvae collected several times on the southeastern coast of Puerto Rico (at Naguabo and Maunabo), and on Mona Island. Prof. Forbes has separated males, larger and with squarer looking wings, from Lares, Cayey and El Yunque under the name *gastralis* Guenée, but wonders if there is any biological basis for such division.

Spilomela fimbriauralis (Guenée) is recorded from Puerto Rico by Dr. Schaus (1940–344): a specimen from Aibonito. Dr. Luis F. Martorell found numerous larvae rolling the leaves of "abeyuelo" (*Colubrina ferruginosa*) at Guajataca Gorge, Quebradillas, in November 1940, and at San Sebastián in December of the same year, being most abundant on trees

in the shade, those in the open not being attacked. The beautiful yellow adults with brown and golden spots were determined as this species by Mr. Carl Heinrich.

Conchylodes diphteralis (Geyer) is listed from Puerto Rico as a *Ledereria* by all the early entomologists, Dr. Gundlach noting "la oruga en especies de *Cordia*, y la crisálida en su capullo, hace saltar este a distancia de algunas pulgadas." This is a conspicuous silvery white moth, its fore wings with circles or bars of black, of which Dr. Luis F. Martorell reared several from gregarious caterpillars webbing together leaves of "capá prieto"

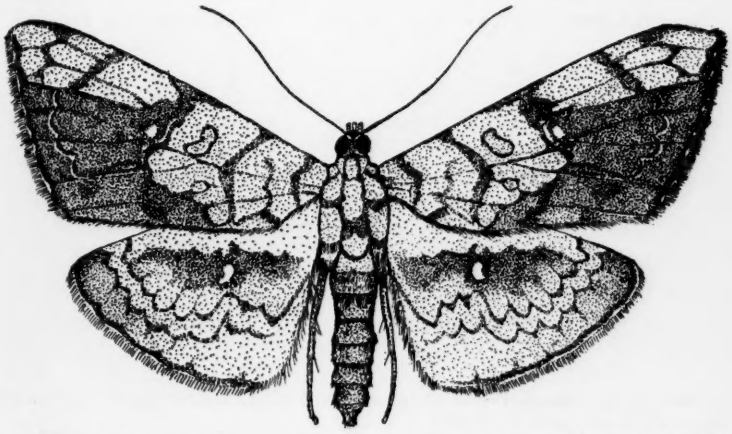


Adult of the Capá Prieto Leaf-Webber, *Conchylodes diphteralis* (Geyer), three times natural size. (Drawn by José F. Pietri.)

(*Cerdana alliodora*) at Cayey in October 1940. They were identified by Mr. Carl Heinrich. Dr. Schaus (1940-345) records collection of adults at Lares, and gives as the distribution of this species, Cuba, Jamaica and Haiti. Dr. Harrison G. Dyar identified as *Concylodes hebraealis* Guenée specimens from Haina, Dominican Republic.

Pantographa limata Grote & Robinson, as identified by Mr. Carl Heinrich, was reared by Dr. Luis F. Martorell from larvae cutting and rolling the leaves of "guano" (*Ochroma pyramidale*) on El Yunque in September 1940. It has been noted repeatedly there, and less often elsewhere, subsequently, but we have no way of determining if it was present in Puerto

Rico previous to that date. Some of the larvae were parasitized by *Chelonus insularis* Cresson. Dr. W. J. Holland in "The Moth Book," on page 393, claims that "the insect occurs from Maine to Patagonia." The U. S. National Museum has no specimens from farther south than Río de Janeiro, Brasil, and none of the South American material was reared. Prof. John Henry Comstock, in discussing the basswood leaf roller, says that "our bass-wood trees often present a strange appearance from the fact that nearly every leaf is cut more than half way across the middle, and the end rolled into a tube. Within this tube there lives a bright green larva, with the head and thoracic shield black. The moth expands about one and one half inches; it is straw-colored, with many



Adult of the Guano and Basswood Leaf-Roller, *Pantographa limata* Grote & Robinson, three times natural size. (Drawn by José F. Pietri.)

elaborate markings of olive with purplish iridescence." The attack on balsa leaves in Puerto Rico is identical with that on basswood in the States, altho the two hosts are not botanically but only superficially similar in having very large leaves.

Dichogama amabilis, described by Herr Heinrich B. Möschler (1890-296) from a pair in the Krug collection from Puerto Rico, was listed by Dr. Gundlach. It has not since been found in Puerto Rico, but Dr. Luis F. Martorell collected numerous specimens at Camp Kofresí, Mona Island in 1939, and Prof. J. A. Ramos (1947-49) made additional collections at the same locality. The silvery white moth has a wing expanse of 35 mm., the fore wing creamy with a small orange spot and black dot at the apex.

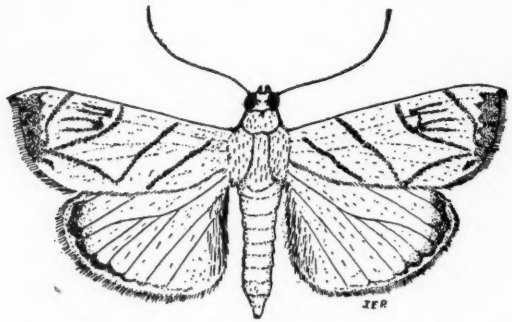
Dichogama bergii was described by Herr Heinrich B. Möschler (1890-

297) from a single female collected by Dr. Gundlach in Puerto Rico. It has not since been found locally.

Dichogama colotha Dyar, originally described from Mexico, is recognized by Dr. Schaus (1940-345): males from Coamo.

Dichogama fernaldi was described by Herr Heinrich B. Möschler (1890-279) from Puerto Rico, and is listed by Dr. Gundlach. Dr. Schaus (1940-346) identifies this species from Vieques Island, and Prof. J. A. Ramos (1947-49) collected a single adult, identified by Prof. Wm. T. M. Forbes, on Mona Island. Adults doubtfully identified as this species by Mr. Carl Heinrich were reared by Dr. Luis F. Martorell from larvae on leaves of "palinguán" (*Capparis flexuosa*) at Salinas in the summer of 1940.

Dichogama gudmanni von Hedemann is recognized by Dr. Schaus (1940-347) from Puerto Rico: specimens from Coamo and Ensenada.



Adult of the Capparis Pod-Borer, *Dichogamma gudmanni* Hedemann, twice natural size. (Drawn by José F. Pietri.)

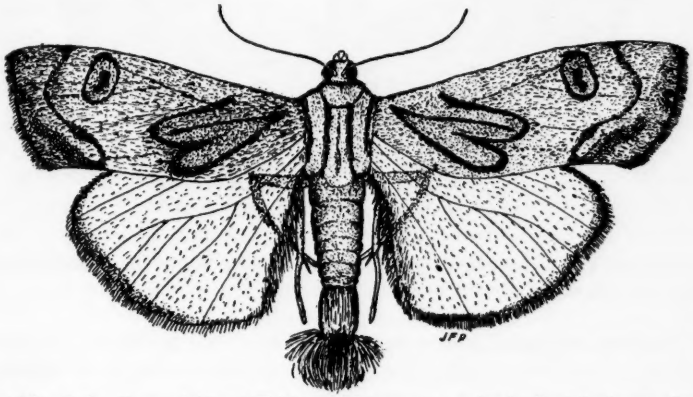
Dr. Luis F. Martorell reared these silvery white adults, as determined by Mr. Carl Heinrich, from larvae folding leaves and burrowing in pods of "burro prieto" (*Capparis cynophallophora*) at Salinas in the summer of 1940. Their fore wings are margined in yellow, and bear a more, or usually less, apparent pattern of fine dark lines.

Dichogama innocua (Fabricius) was re-described and illustrated by Herr Heinrich B. Möschler (1890-296) as *D. krugii* from Puerto Rican material of which Dr. Gundlach had five specimens of both sexes. Dr. Schaus (1940-346) recognizes as this species specimens from Coamo. Judging by Möschler's illustration, it is only a more distinctly patterned *gudmanni*.

Dichogamma jessicales is described by Dr. Wm. Schaus (1940-346) from a male with a wing expanse of 25 mm., from Coamo, mostly white, its fore wings "finely irrorated with pale smoke grey and suffused with light drab."

Dichogama redtenbacheri Lederer was listed from Puerto Rico by Herr

Möschler, and Dr. Gundlach notes "también en Cuba, Santo Tomás, Santa Cruz." Dr. Schaus (1940-346) lists it from Coamo and the Island of Vieques, and numerous adults have been taken at light on Mona Island, as noted by Prof. J. A. Ramos (1947-49). Mr. E. G. Smyth collected three adults at light at Hda. Santa Rita, Guánica, during the latter half of 1913, identified by Dr. Harrison G. Dyar. Dr. Luis F. Martorell noted heavy infestations of caterpillars feeding on the foliage of "palinguán" or "palo de burro" (*Capparis flexuosa*) at Salinas, Santa Isabel, Yauco, Guánica and Arecibo during the summer of 1940, and reared adults which were identified by Mr. Carl Heinrich. Some are a satiny and semitransparent brownish yellow, with but the faintest indication of a pattern on the



Adult of the Capparis Leaf-Webber, *Dichogamma redtenbacheri* Lederer, three times natural size. (Drawn by José F. Pietri.)

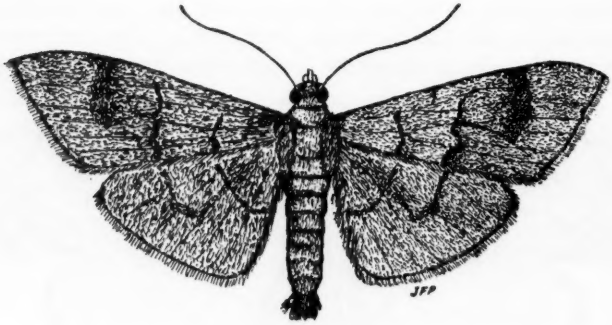
fore wing; others have very conspicuous markings in dark brown, or but slightly darker oval or irregular areas with dark brown margins.

Phostria humeralis (Guenée), listed from Puerto Rico as an *Omoides* by Herr Möschler and Dr. Gundlach, was recently collected at light at Utuado by Dr. W. A. Hoffman, and Dr. Schaus (1940-347) lists collection at Lares. From green caterpillars feeding on the foliage of "guaba" (*Inga vera*) at Cayey in December 1940, Dr. Luis F. Martorell reared adults which were determined as being this species by Mr. Carl Heinrich. With a wing spread of 32 mm., these almost plain, dull, dark brown moths have shoulder lappets or patagia extending as far back as the anal angle of the hind wings.

Phostria insolutalis was described by Herr Heinrich B. Möschler (1890-301), but Dr. Gundlach states that he "no indica si hay seguridad de su existencia en Puerto Rico," and no collection has since been made locally.

Phostria martyralis (Lederer) was listed from Puerto Rico as a *Coenos-*

tola by Herr Möschler and Dr. Gundlach, the latter noting its abundance in Cuba. During the winter of 1940–41, Dr. Luis F. Martorell found greenish caterpillars webbing together leaves of "genogeno" (*Lonchocarpus domingensis*) at Guayanilla and of "palo hediondo" (*Lonchocarpus latifolius*) at Maunabo, which he reared to adult. These were identified by Mr. Carl Heinrich: orange-brown moths with three narrow darker bands on the fore wings and two on the hind wings.



Adult of the Lonchocarpus Leaf-Webber, *Phostria martyralis* (Lederer), three times natural size. (Drawn by José F. Pietri.)

Phostria originalis Lederer, as identified by Dr. Wm. Schaus, was reared by Dr. Luis F. Martorell in the summer of 1936 and again in 1940 from greenish caterpillars living congregated in a dense web and feeding on the foliage of "moca" (*Andira jamaicensis*) at Barranquitas, Aibonito and Cayey. The adult is a light yellowish-brown moth with the standard three narrow wavy darker bands on the fore wings and two on the hind wings. Mr. Hahn W. Capps states that the name *martyralis*, for an East Indian species, is incorrect for the Puerto Rican insect.

Phostria prolongalis (Guenée), listed from Puerto Rico as a *Microthyris* by Herr Möschler and Dr. Gundlach, is confirmed by a subsequent collection at Aibonito recorded by Dr. Schaus (1940-347).

Phostria simialis (Guenée), listed from Puerto Rico as *Coenostola eruptalis* Lederer by Herr Möschler and Dr. Gundlach, has been intercepted at light at Bayamón.

Blepharomastix acutangulalis (Snellen) is identified as a *Bocchoris* by Dr. Schaus (1940–342): specimens from Coame and San Germán.

Blepharomastix ebulealis (Guenée) is identified by Dr. Schaus (1940-350), specimens from Lares and El Yunque. Dr. Luis F. Martorell found larvae of this species acting as leaf-folders on a "camasey" (*Heterotrichum cymosum*), some of which were parasitized by the Tachinid fly *Leskiopalpus*

flavipennis (Wiedemann). Those reared to adults, as determined by Mr. Carl Heinrich, had a wing spread of 15 mm., were golden yellow in color, their wings with transverse brown lines.

Blepharomastix stenialis (Guenée), as determined by Mr. Carl Heinrich, was collected by Dr. W. A. Hoffman at El Semil, Villalba, May 10, 1940. Prof. Forbes notes an additional collection at Cayey by Mr. Huntoon of this moth which occurs thruout the neotropics from Argentina to Massachusetts. By other workers it is called a *Lamprosema* or a *Nacoleia*.

Lamprosema inabsconsalis was described as a *Diasemia* by Herr Heinrich B. Möschler (1890-306) from both sexes collected in Puerto Rico by Dr. Gundlach, and listed by him. More recent collections listed by Dr. Schaus (1940-350) are from Lares, Coamo and Aguirre, and from Vieques Island. Prof. J. A. Ramos (1947-50) found a single specimen at light on Mona Island.

Lamprosema iarchisalis (Walker) is identified by Dr. Schaus (1940-349) from Puerto Rico: specimens from Lares, Coamo, Aguirre and Palmas Abajo (between Guayama and Jájome Alto).

Lamprosema memoralis was described by Dr. Wm. Schaus (1940-348), the type from Coamo, wing expanse 14 mm., "head and thorax brownish drab"; "wings grayish drab." It was this species which was cited by Herr Möschler and Dr. Gundlach as *Lamprosema lunulalis* Hübner from Surinam, from which it differs in size and markings.

The Cornell University collection contains a single specimen labeled "*Lamprosema santialis* Schaus", very close to the continental *pelealis* Walker, according to Prof. Forbes, which was collected at Coamo Springs. Apparently Dr. Schaus did not publish a description, and this is a MS name.

Lamprosema subulalis (Guenée) was re-described and illustrated from Puerto Rico by Herr Möschler and listed by Dr. Gundlach under the name of *Sisyracera preciosalis*, also from Surinam. Dr. Schaus (1940-348) records occurrence in Guatemala, and in Puerto Rico.

Lamprosema xanthialis (Guenée) was listed from Puerto Rico as *Botys incalis* Snellen, of which Herr Heinrich B. Möschler (1890-285) described the variety *rosealis*, "not separable," according to Dr. Schaus (1940-350). Adults of this moth, which is common in Hispaniola and Cuba, have repeatedly been intercepted at Bayamón.

Lamprosema zoilusalis (Walker) was re-described from Jamaica by Herr Heinrich B. Möschler and listed by him and Dr. Gundlach from Puerto Rico under the name *Botys hilaralis*. It has been intercepted at light at Bayamón and Mayaguez, and Dr. Hoffman collected it at Utuado. Dr. Schaus (1940-349) lists additional collections at Lares, Aibonito, Coamo, Manatí and San Germán.

Hedylepta indicata (Fabricius) was listed from Puerto Rico by all the early entomologists as *Hedylepta vulgalis* (Guenée) and according to Dr. Schaus (1940-349) also re-described by Herr Möschler (1890-288) as *Botys fortificalis*. Dr. Gundlach gives both names, noting of the former "la oruga se cría entre las hojas reunidas de plantas de la familia de las papilionáceas." Mr. H. K. Plank uses the generic name *Hedylepta* (1945-26) in discussing these caterpillars as a pest of soybeans, from which he reared three parasites, but Mr. Thos. H. Jones (1915-9) uses *Nacoleia* in noting their attack on the leaves of beans and cowpeas, as does Dr. Richard T. Cotton (1918-278), giving as a common name the "bean leaf-webber." He continues: "The small, dirty-green colored larva webs the leaves (of bean) together, living between them and skeletonizing them with its feeding." The little dull golden-brown moths are common at light in all the more humid parts of the Island, as well as on Vieques. The adult reared by Mr. E. G. Smyth from a larva on *Lantana camara* is not this species, being much more yellow, the transverse brown lines on the forewings being narrow and regular, not broad and broken. Those he reared from caterpillars on "zarzabacoa" (*Meibomia purpurea*) in the summer of 1916, are typical however, and since the introduction of derris into Puerto Rico, its leaves have repeatedly been observed attacked, first at Río Piedras and subsequently at Mayagüez. In the Mayagüez Station Report for 1938 (1939-108) their parasitism by *Chrysocharis* sp. and *Apanteles* sp. is noted. The common parasite, attacking other Pyralid leaf-webbers as well, is the Tachinid fly, *Sturmia* (or *Argyrophylax*) *albincisa* (Wiedemann). Despite heavy parasitism the caterpillars are often of sufficient abundance on garden beans and lima beans to require control by means of insecticides, calcium arsenate being the standard remedy until DDT and others of the newer chemicals were commercially available.

Sylepta ceresalis (Walker) was re-described from Puerto Rico by Herr Heinrich B. Möschler (1890-314) as *Diaphantania conspicualis* from three females which Dr. Gundlach had collected. Dr. Schaus (1940-352) lists a more recent collection from Coamo, and Prof. Forbes found it on Vieques Island.

Sylepta denticulinea was described by Dr. Wm. Schaus (1940-351) from a single badly rubbed female, intercepted at light at Bayamón, which has a wing expanse of 25 mm., mostly light buff in color, "but easily recognized by the outer line."

Sylepta elevata (Fabricius) was listed as a *Botys* from Puerto Rico by Herr Möschler and Dr. Gundlach. Mr. E. G. Smyth collected only six of these "speckled yellow Pyralids" at light at Hda. Santa Rita, Guánica during the latter half of 1913, as determined by Dr. Harrison G. Dyar, and only one at Río Piedras. It has been intercepted at light at Bayamón,

and Dr. Schaus (1940-353) notes additional collections at Mayagüez and San Germán. Mr. E. Molinary Salés found larvae in the tubers of sweet potatoes, in stems, and even eating into wooden stakes at the surface of the ground of experimental plots, late in 1947, from which many adults were reared. The moths have black eyes, but otherwise are a dull, light yellow, with dark pink spots on body, abdomen and wings; the fore wing sometimes having as many as thirty spots on it, quite evenly distributed from base to outer margin. This is the first recorded instance of this insect being a pest in Puerto Rico, and indeed, up to the time of Mr. Molinary's collection nothing was known locally as to the host plant of the larva. Dr. Gundlach gives the distribution of the insect as Belém do Pará, the Guianas and Cuba, and in the "Catálogo de los Insectos que Atacan a las Plantas Económicas de Cuba" (Boletín No. 63, Estación Experimental Agronómica, pp. 246, pl. 12. Santiago de las Vegas, September 1945) Messrs. S. C. Bruner, L. C. Scaramuzza and A. R. Otero record its interception in sweet potatoes at Santiago de las Vegas in abundance in August 1930. "Las larvas, aparentemente, se alimentan de los tejidos exteriores. No se ha observado en boniatos en otra ocasión, y su *status* como plaga es dudoso."

Sylepta gordialis (Guenée) was listed from Puerto Rico by all the early entomologists as an *Asciodes*, and Dr. Gundlach and Herr Möschler also give the name *Asciodes scopulalis* Guenée in doubtful synonymy. The caterpillars web together the leaves of the Bougainvillea vine, and have been reared to adult, as determined by Dr. Harrison G. Dyar, at Río Piedras, at Pt. Cangrejos and at Isabela. They have also been intercepted eating the leaves of four o'clock at San Juan, and adults have been repeatedly intercepted at light at Bayamón. Dr. Schaus (1940-351) lists additional collections at Coamo, Lares and San Germán, as well as on Vieques, and presumably the insect occurs wherever its host is planted. The moth is singularly uninteresting; dull grey in color, forewings barred and the hind wings margined with darker grey. If handpicking does not control the caterpillars, one might try, with caution, spraying with a water-suspension of DDT.

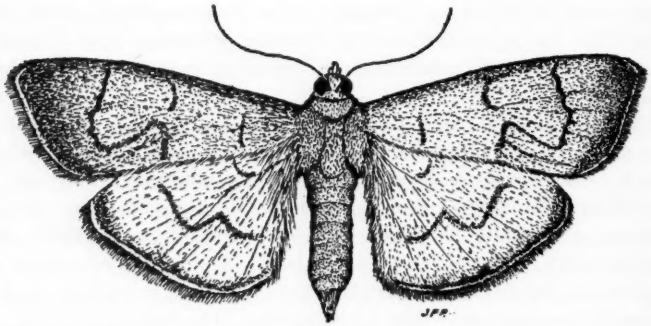
Sylepta helcitalis (Walker) was re-described by Herr Heinrich B. Möschler (1890-308) from three males collected by Dr. Gundlach in Puerto Rico under the name of *Crossophora miscellalis*. Dr. Schaus (1940-351) records collection of adults at Lares and on El Yunque. Under this name, Mr. Charles E. Wilson, writing of the "Truck-Crop Insect Pests in the Virgin Islands and Methods of Combating Them" (Bulletin No. 4, Virgin Islands Agr. Expt. Station, pp. 35, fig. 24. Washington, D. C., 1923), describes a sweet potato leaf-folder, apparently of considerable importance, parasitized by a Tachinid fly (*Exorista pyste*). This name is not listed by

Mr. Harry A. Beatty in his "Fauna of St. Croix" (Jour. Agr. Univ. P. R., **28** (3–4): 103–185). Río Piedras, July–October 1944), altho he had access to all the insect determinations of the Experiment Station.

Sylepta internitalis (Guenée) was listed from Puerto Rico by all the early entomologists as *Sathria stercoralis* Lederer. Dr. Schaus (1940-352) notes a more recent collection at Coamo.

Sylepta onophasalis (Walker) is listed from Puerto Rico by Dr. Schaus (1940-252): collections from Coamo, Aibonito and from Vieques Island.

Sylepta patagialis (Zeller) is listed from Puerto Rico by Herr Möschler and Dr. Gundlach under the name of *Herpetogramma servalis* Lederer. Dr. Gundlach had three females, but Dr. Schaus (1940-351) is of the opinion that "there is a misidentification." Dr. W. A. Hoffman collected females at El Semil, Villalba, May 10, 1941, concerning which Mr. Carl Heinrich noted "must have males for exact determination."



Adult of the Yagrumo and Ortiga Leaf-Roller, *Sylepta silicalis* (Guenée), three times natural size. (Drawn by José F. Pietri.)

Sylepta silicalis (Guenée), as determined by Dr. Harrison G. Dyar, is a rich, cream-colored moth, with very faint pinkish transverse lines on its wings, of which larvae have been found feeding on the leaves of "yagrumo" (*Cecropia peltata*) at Lares and on El Yunque, especially singling out the more tender leaves and the bud for consumption. Dr. Luis F. Martorell found similar larvae feeding on the leaves of *Urera chlorocarpa* at Jayuya, from which a single adult reared appeared to be this species. Mr. H. W. Capps identified a single adult reared from a large number of larvae which had half defoliated a clump of the nettle "ortiga" (*Urera baccifera*) at La Romana, Dominican Republic, as being this species, confirming the selection for consumption by these larvae of plants which seem most unlike, but botanically are in adjoining families.

Lygropia imparalis (Walker) is identified as *L. flavofuscalis* (Snellen)

by Dr. Schaus (1940-353) specimens from Cataño, Aguas Claras (between Fajardo and Naguabo), Aguirre and from the Island of Vieques.

Lygropia joelalis was described by Dr. Wm. Schaus (1940-354) from a female collected on Vieques Island by Prof. Wm. T. M. Forbes, "allied to *L. flavofuscalis* (Snellen)," which has a wing expanse of 12 mm., "palpi isabella color," "head, collar and thorax very light brownish olive;" "wings above very light brownish drab." Prof. Forbes thinks it merely a variety of *flavofuscalis* which has lost all the yellow marks except the basal one, for he caught several normal *flavofuscalis* with the type.

Lygropia joasharia was described by Dr. Wm. Schaus (1940-353) from a female, collected on Vieques Island by Prof. Wm. T. M. Forbes, which has a wing expanse of 17 mm., "head, collar and thorax pinkish cinnamon; fore wing pale yellow orange," "easily recognized by the distinct line on discocellular."

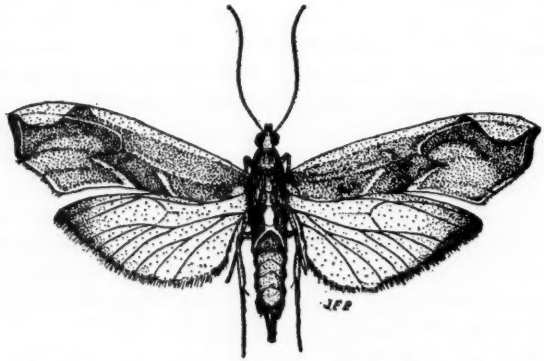
Lygropia lelex (Cramer) was re-described by Herr Heinrich B. Möschler (1890-309) and listed by Dr. Gundlach from Puerto Rico under the name of *Cyclocena gestatalis*. In November 1921, Mr. J. D. More collected a leaf-tier on the leaves of sweet potato which he reared to an adult that was determined as this species by Dr. Schaus. It is an inconspicuous little light brown moth with very wavy lines on the wings, which has not been found to date elsewhere than at Río Piedras since the collection of the two males noted by Dr. Gundlach.

Lygropia placendalis was described as a *Botys* by Herr Heinrich B. Möschler (1890-285) and thus listed by Dr. Gundlach from a single female which he had collected in Puerto Rico. It has not since been found locally.

Lygropia principaloides was described as a *Botys* by Herr Heinrich B. Möschler (1890-295), and thus listed by Dr. Gundlach from a single male which he had collected in Puerto Rico. It has not since been found locally.

Agathodes designalis Guenée was listed from Puerto Rico as a *Stenurges* by Herr Möschler and Dr. Gundlach, the former noting "Raupe nach Berg auf Erythrina cristigalli, nach Guenée an Asclepias incarnata, nach Le Conte an Salix." According to observations in Puerto Rico, various species of *Erythrina* are most often selected for hosts, the caterpillars not only rolling leaves, but also boring in tender watershoots, and sometimes even in the bark of large trees, noted at Río Piedras, Cayey, Aibonito, Villalba and Arecibo. Indeed, this might well be called the Erythrina or bucare stem borer, altho Dr. Richard T. Cotton in January 1917 found numerous yellow larvae spotted with black on a tree near Río Piedras identified by Mr. J. A. Stevenson as *Citharexylum fruticosum*, the common "péndula." Adults have been collected at light at Villalba, Mayagüez, and Añasco, and presumably the insect occurs in all the mountainous and humid sections of the Island. The moth in colors is a symphony in gold

and lavender, but rests in a most ungainly position with the end of its abdomen straight up. Its narrow, angled and cleft forewings are dull gold, with a median parallelogram of lavender laterally bordered with iridescent silver, the same colors appearing on its body. The moths are sometimes common at light, reflecting a comparable abundance of the caterpillars, especially in nurseries of young trees. Earwigs, several kinds of ants, and numerous other insects may subsequently occupy their tunnels after the emergence of the adults.



Adult of the Bucare Stem-Borer, *Agathodes designalis* Guenée, two and a half times natural size. (Drawn by José F. Pietri.)

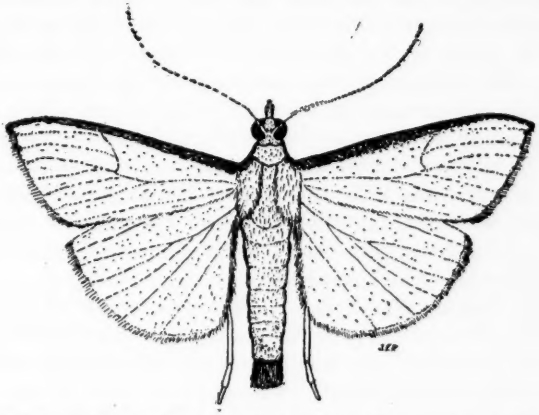
Diaphania ausonia (Cramer) was listed as a *Hoterodes* by all the early entomologists from Puerto Rico, but it has not since been found locally.

Diaphania (or **Margaronia**) **costata** (Fabricius) was listed from Puerto Rico by Herr Möschler and Dr. Gundlach under the name of *Pachyarches aurocostalis* Guenée: a singularly appropriate name for an all silvery white moth except for the costal margin of the forewings, which is golden. Mr. E. G. Smyth took ten of these "bluish-white Pyralids" at light at Hda. Santa Rita, Guánica during the latter half of 1913, and Dr. Schaus (1940-356) lists collections at Coamo, San Germán and from Vieques Island. Prof. J. A. Ramos (1947-50) collected adults at light on Mona Island, and noted the larvae on their host plant, "palo de muñeca" (*Rauwolfia nitida*). Each larva makes a very neat bag of one or two leaves, within which it lives and eventually within which it pupates, such characteristic bags having first been noted at Camuy, and subsequently at Guajataca and Guayama. Mr. Francisco Seín found several larvae rolling the leaves of a climbing bean at Boquerón in January 1923, which, when reared to adult, proved to be this species.

Diaphania flegia (Cramer) is a considerably larger moth than *D.*

costalis, and the costal margin of its forewings is brown, not golden. Mr. J. A. Stevenson brought in larvae from Isabela Grove, Plantaje, Pt. Salinas, in July 1916, which he found eating the leaves and webbing together the foliage of the "cabalonga" or "cabalón," the lucky nut tree (*Cerbera* or *Thevetia thevetia*), and in April 1937, Dr. Mel. T. Cook found them on the same host at La Fortaleza, San Juan. Twice collected by Plant Pathologists, the third record on the same host at Isabela was by Mr. Francisco Seín, in July 1933, and later at Lares.

Diaphania elegans was described as a *Phacellura* by Herr Heinrich B. Möschler (1890-299) and thus listed by Dr. Gundlach from several specimens from Puerto Rico. It has been intercepted on medicinal herbs at



Adult of the Rauwolfia Leaf-Folder, *Diaphania* (or *Margaronia*) *costata* (F.), three times natural size. (Drawn by José F. Pietri.)

San Juan, as identified by Mr. Carl Heinrich, and Dr. Schaus (1940-356) records collections from El Yunque, and from St. Croix and St. John of the Virgin Islands, under the name *Margaronia*, as of all others of the genus.

Diaphania fuscicaudalis (Möschler), originally described from Jamaica and Surinam, is listed from Puerto Rico by Herr Möschler and Dr. Gundlach, but it has not since been found in the West Indies, according to Dr. Schaus (1940-357).

Diaphania hyalinata (Linnaeus) is listed from Puerto Rico by Dr. Stahl as *Phacellura immaculalis* Guenée, and by Herr Möschler and Dr. Gundlach with the latter name as a variety, the latter quoting the former that "la oruga se cría en curcubitaceas y también en *Ipomoea*." Both are quite correct as to the cucurbitaceous hosts, for caterpillars have repeatedly been found on cucumber, cantaloupe, watermelon, cassava melon, pump-

kin, squash and cocozelle squash, and even on yautía, but not on sweet potatoes or any wild species of *Ipomoea*. This is the "melonworm" of the United States, listed as a *Diaphania* by Mr. O. W. Barrett (1903-448), Mr. Thos. H. Jones (1916-8), Dr. R. T. Cotton (1918-294) and in Van Zwaluwenburg's list (920): on Cucurbitaceae. The longitudinally-striped caterpillars feed on the more tender leaves, on the flowers, and even on the developing young fruits of many of these plants. By adding arsenate of lead to the Bordeaux mixture that must be used to obtain a commercial crop, control of the melonworm has been obtained in the past. Because DDT prevents fruiting of cucumbers, it can not be used for the control of this caterpillar, and the use of others of newer insecticides is indicated, although none has been sufficiently tested in the tropics for specific recommendation. The head and thorax of the moth is brown, as are also the broad outer margins of all wings and the costal margin of the fore wing. The triangular inner area of the wings is semi-transparent silvery white, and the abdomen is also white, tipped with a relatively enormous brush of golden and brown scales, which in life the moth opens and contracts and waves about when others of the opposite sex are present.

The manufacturers of lindane, the new technically pure gamma isomer of benzene hexachloride, state that at 1% this is safe to use on cucumbers for control of the melonworm, and that large amounts are being used by growers in Florida at the present time.

Diaphania immaculalis (Guenée), listed as a variety of *hyalinata* (L.) by Herr Möschler and Dr. Gundlach, is considered a distinct species by Dr. Schaus (1940-357), who lists collections from Coamo and Arecibo, and from the Island of Vieques.

Diaphania imitalis (Guenée) is listed by Dr. Schaus (1940-357) from Puerto Rico: specimens from Coamo, for he considers it "a distinct species, and not a synonym of *M. aurocostalis* (Guenée) as stated by Hampson."

Diaphania infernalis, as a *Phacellura* is described by Herr Heinrich B. Möschler (1890-300) as "am nächsten bei *Nitidalis* stehend," and is listed by Dr. Gundlach from Puerto Rico. Adults determined by Mr. Carl Heinrich were collected by Dr. W. A. Hoffman at El Semil, Villalba on May 10, 1941, and Mr. Francisco Seín found it at Lares.

Diaphania infimalis (Guenée) is listed by Dr. Schaus (1940-356) from Puerto Rico: a specimen from Mayagüez.

Diaphania isoscelalis (Guenée) is listed from Puerto Rico by Herr Möschler and Dr. Gundlach, but has not since been found locally.

Diaphania lucidalis (Hübner) is listed from Puerto Rico by all the early entomologists as a *Phacellura*, and Dr. Schaus (1940-357) lists a subsequent collection at Santurce.

Diaphania nitidalis (Cramer) is listed by Dr. Stahl as *Phacellura hyalinasalis*, and by Herr Möschler and Dr. Gundlach as a *Phacellura*. Mr. Francisco Seín, writing on "The Pickle Worm in Chayote in Porto Rico" (Jour. Ec. Ent., **24**(3): 762. Geneva, June 1921), reports finding 20 per cent of the "chayote" (*Sechium edule*) fruits infested with these caterpillars at Lares and five to ten per cent at Río Piedras. It also infests the fruit of cucumbers, interceptions having been made at Loíza Aldea, Vega Baja, Manatí and Isabela, and is not subject to insecticidal control for it burrows within the fruit. The adult is a golden brown moth, the base of the hind wings and a smaller irregular-shaped area in the forewings being semi-transparent golden yellow. It is rarely taken at light, altho Dr. W. A. Hoffman made collections at El Semil, Villalba. Apparently the insect is more common in the mountains than at lower elevations, and is not found at all in xerophytic regions.

Diaphania sibillalis (Walker) was listed from Puerto Rico by Herr Möschler and Dr. Gundlach as a *Glyphodes*. It is a beautiful golden brown and white moth, its fore wings having three larger irregular white areas partly iridescent golden, separated by dark brown margined light brown areas, and a narrow, irregular, submarginal white band that continues on the hind wings. The moths which Mr. Francisco Seín reared from caterpillars which he found during the winter of 1922 feeding on the leaves of mulberry (*Morus alba*, var. *tartarica*) are somewhat different, however, having in addition on the hind wings an irregular brown band surrounding the central iridescent golden area, and submarginally more brown. Adults have repeatedly been intercepted at light at Bayamón, and Dr. Schaus (1940-358) reports additional collections at San Juan, Aguirre, Coamo, and Guánica, as well as on Vieques Island.

Palpita quadristigmalis (Guenée) was listed from Puerto Rico by Herr Möschler and Dr. Gundlach as a *Margarodes*, and it has since been collected at light at Guánica and intercepted at Bayamón. Dr. Schaus (1940–358) notes additional collections on El Yunque and on Vieques Island. It has semi-transparent, whitish wings, the costal margin brown, with four small black spots or points as indicated by the name; and in addition two near the apex and one in the middle of the hind wing.

Cliniodes euphrosinalis Möschler, originally described from Jamaica, was listed from Puerto Rico by Herr Möschler and Dr. Gundlach: a single well preserved specimen in the Krug collection. It has not since been found locally. *Cliniodes* sp. "near *nomadalis* Dyar" was the determination by Mr. Carl Heinrich of a large moth with semi-transparent silvery wings, narrow lines of black on the outer margin of the hind wing, brownish at base of forewing and scatteringly elsewhere, which Dr. W. A. Hoffman had taken at light at El Semil, Villalba on May 10, 1940.

Cliniodes semilunalis was described by Herr Heinrich B. Möschler from several females in the Staudinger collection from Puerto Rico (1890-297), and is listed by Dr. Gundlach. It has not since been found locally.

Syllepsis marialis Poey, originally described from Cuba, was recognized by Herr Möschler in the Krug collection from Puerto Rico, and is listed by Dr. Gundlach. Dr. Schaus (1940-359) notes collections from Aibonito and Coamo. Dr. Luis F. Martorell found numerous small green larvae rolling the leaves of "quebracho" (*Thyana portoricensis*) at Guayanilla, especially in the most shady locations, in January 1941, from which he reared adults which were determined as being this species by Mr. Hahn W. Capps. The body of this slender moth is purplish brown, as are also broadly the apical angles of both wings and the base and hind angle of the forewing; elsewhere the wings are semi-transparent golden.

Leucinodes elegantalis Guenée, the name under which Dr. Gundlach listed the two specimens he had collected in Puerto Rico, as identified by Herr Möschler, and Dr. Schaus (1940-360) lists subsequent collections at nine Puerto Rican localities, should be **Neoleucinodes elegantalis** (Guenée) according to Mr. Hahn W. Capps, who has studied the "Status of the Pyraustid Moths of the Genus *Leucinodes* in the New World, with Descriptions of New Genera and Species" (Proc. U. S. Nat. Museum, **98**(3223): 69–83, pl. 6. Washington, D. C., 1948). It "has recently attracted considerable attention as a pest of tomatoes in South America, where severe damage to crops has been reported. The damage to crops where *elegantalis* occurs, ranges from unnoted in such places as Cuba and Puerto Rico, negligible in Mexico, to as high as 30 to 80 per cent in Paraná and Minas Gerais, Brazil. The larvae are strictly borers, feeding only in the fruits. Soon after hatching, the young larva bores into the young fruit, and as the fruit develops, the entrance hole is closed. Thus, a fruit that looks perfectly normal, even under a hand lens, may contain one or several larvae. The number of larvae per fruit is usually one, two, or three, but as many as 18 have been found in a single fruit.', The slender little brownish moth has been repeatedly collected at light at Río Piedras, and intercepted at Bayamón. Its hyaline white wings are marked with cinnamon brown areas at base and apex of the fore wings, and less conspicuous bands or areas elsewhere.

Neoleucinodes prophetica (Dyar) is listed by Mr. Hahn W. Capps (1948-76) from Adjuntas, Puerto Rico.

Neoleucinodes torvis was described by Mr. Hahn W. Capps (1948-77), the type from Santiago de las Vegas, Cuba, reared from *Solanum torvum*; others from Río Piedras, Bayamón, Coamo, Utuado, Lares and San Germán, of which "well-marked specimens resemble small examples of *ele-*

gantalis, dissolvens and *prophetica*, but are easily separated from them by the very short pubescent-like cilia of antenna."

Ommatospila narcaeusalis (Walker) was identified as *O. nummulalis* Lederer by Herr Möschler for the single female which Dr. Gundlach had collected in Puerto Rico. Dr. Schaus (1940-361) lists additional collections at Coamo and San Germán, and has identified numerous unlabeled specimens. It is a strikingly beautiful little moth, with a complicated pattern of oval and elongated spots outlined in dark brown, and narrow transverse brown lines on the distal margin of areas becoming increasingly darker from a semitransparent, iridescent whitish base.

Hellula phidilealis (Walker) was listed from Puerto Rico as *H. undalis* Hübner by Herr Möschler and Dr. Gundlach, and Dr. Schaus (1940-361) records collections from Ensenada, San Germán, Aibonito and Coamo, and from the Island of Vieques. He identified several unlabeled specimens: small moths with irregular dull yellowish-green stripes and areas on the forewings.

Epipagis cambogialis (Guenée) was re-described as *Botys citrinalis* by Herr Heinrich B. Möschler (1890-282) from a single male collected by Dr. Gundlach in Puerto Rico, and also listed as *Botys cambogialis* Guenée. Dr. Schaus (1940-362) "can find no reason to separate *E. citrinalis*," listing collections at Aguirre, Coamo, Ponce and Guánica. He identified specimens collected at Utuado and at Palmas Abajo by Dr. W. A. Hoffman as this species.

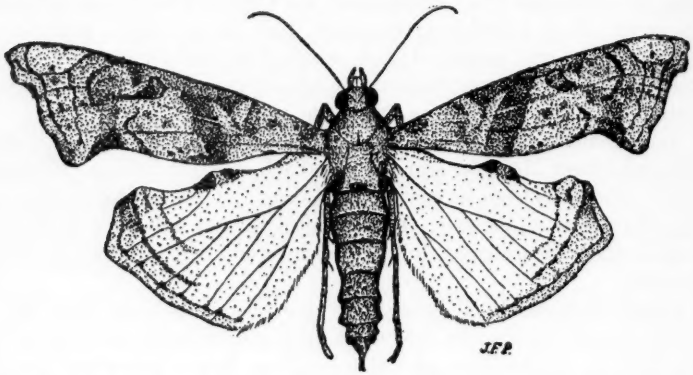
Epipagis conjunctalis was described as a *Samea* by Herr Heinrich B. Möschler (1890-290) from a single female in the Staudinger collection and it is thus listed by Dr. Gundlach. It has not since been found anywhere.

Epipagis mopsalis (Walker) was described as *Botys villicalis* by Herr Heinrich B. Möschler from Jamaica, and listed by him and Dr. Gundlach from Puerto Rico, the latter having three specimens. Dr. Schaus (1940-362) notes collections from Guánica, Coamo, Aibonito, Lares and Cataño, and from the Island of Vieques.

Epipagis togalis (Lederer) was listed as a *Botys* from Puerto Rico by all the early entomologists, but has not since been found locally.

Terastia meticulosalis Guenée was first determined by Dr. Harrison G. Dyar from Puerto Rico: adults from Río Piedras reared from larvae boring in a planting of trees of *Erythrina glauca*, 90 percent of which were infested in September 1921. It has since been found in similar seedlings of *Erythrina berteroana* at Villalba, in the pods of *Erythrina glauca* at Río Piedras, and most destructively in the pods of the cardinal-flowered *Erythrina horrida* at Río Piedras. Adults have been intercepted at light at Bayamón and at Mayagüez, and were collected by Dr. W. A. Hoffman at Utuado and

El Semil, Villalba. In size and shape of the wings it somewhat resembles the other Erythrina shoot-borer, *Agathodes designalis*, but both the costal margin of the hind wing and the inner margin of the fore wing are deeply cleft; its colors are various shades of brown in places speckled with black; and the semi-transparent areas are silvery, not golden.



Adult of the Bucare Seedling and Pod Borer, *Terastia meticulosalis* Guenée, two and a half times natural size. (Drawn by José F. Pietri.)

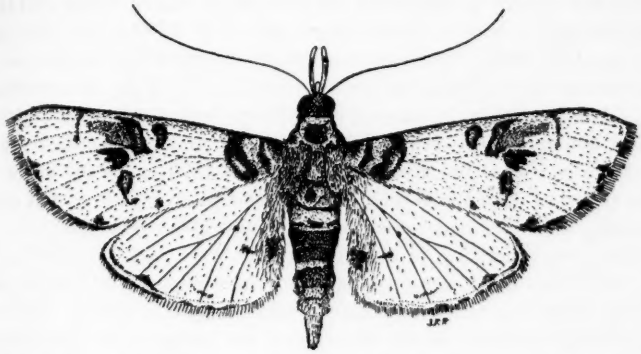
Azochis euvexalis was described as a *Catacteniza* by Herr Heinrich B. Möschler (1890-314) from four females collected by Dr. Gundlach in Puerto Rico and listed by him under this name. Mr. E. G. Smyth collected sixty-four of these "handsome white Pyralids with brown markings" at light at Hda. Santa Rita, Guánica, during the latter half of 1913, and subsequently a single specimen at light at Río Piedras, August 20, 1916. These were identified by Dr. Schaus, who (1940-363) lists additional collections at Arecibo, Coamo, Dorado and from Vieques Island. The iridescence on the clear white areas of the fore wings of this moth is light blue; that of the hind wings is less obviously lavender.

Azochis "probably *rufidiscalis* Hampson" is the identification by Mr. Carl Heinrich of a moth which Dr. Luis F. Martorell reared in the autumn of 1940 from a larva boring in the twigs of "jagüey" (*Ficus stahlii*) at Camuy.

Crocidophora algarrobolis was described by Dr. Wm. Schaus (1940-364), the type collected by Mr. Thos. H. Jones at Algarrobo (near Tortuguero Lagoon) on July 26, 1914: a male with a wing expanse of 20 mm., others from San Juan, Cataño, Dorado, Isabela and Lares, and from Vieques Island. This is what Herr Möschler and Dr. Gundlach list from Puerto Rico under the name *Stenophyes serinalis* Walker, what Dr. Harrison G. Dyar had identified as *Crocidophora zinghalis* Walker, and, as reported in

"Insectae Borinquenses" (1936-464), what Dr. Schaus had identified as *Crocidophora huronalis* Guenée. Its fore wings are mostly light brown with white spots; the hind wings white with deep brown margin and two transverse stripes.

Crocidophora palindialis (Guenée) was described as *Orobena implicitalis* by Herr Heinrich B. Möschler (1890-292) from a male and two females collected by Dr. Gundlach in Puerto Rico, and listed by him. It has since been intercepted at Vega Alta, and listed by Dr. Schaus as a *Crocidolomia.*



Adult of the Jagüey Twig-Borer, *Azochis rufidiscalis* Hampson, twice natural size. (Drawn by José F. Pietri.)

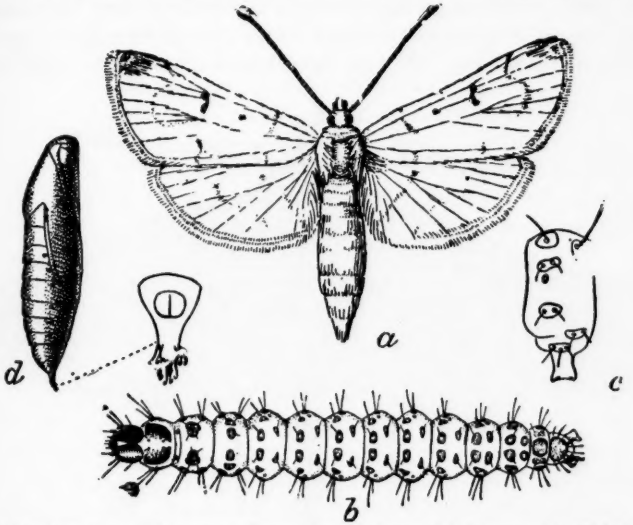
Maruca testulalis (Geyer), as identified by Dr. Harrison G. Dyar, was listed from Puerto Rico as a *Crochiphora* not only by Herr Möschler and Dr. Gundlach, but also by Dr. Schaus. 'According to Mr. H. W. Capps, "*Crochiphora* is not available for use in the Pyraustidae," and the correct name is **Maruca,** which, fortunately, is the name used in the economic publications on bean pod-borers. Its presence in Puerto Rico was in considerable part responsible for the establishment of the quarantine and inspection regulations governing the importation of vegetables into continental United States. The action taken as a result of a "Report of Hearing Held by the Federal Horticultural Board to Consider the Advisability of Restricting or Prohibiting the Entry from Porto Rico of Fruits and Vegetables into the United States" (Jour. Dept. Agr. P. R., **8** (1): 5–46, pl. 1. San Juan, August 1945) was the "Fruit and Vegetable Quarantine of Puerto Rico Notice of Quarantine of Porto Rico Notice of Quarantine No. 58" (Fed. Hort. Board, U.S.D.A., Washington, D. C., May 27, 1925), enforced by federal inspectors with headquarters at San Juan. These men did not confine their activities to merely inspecting the fruit and vegetables after they were packed for shipment, but visited fruit groves and vegetable farms in all parts of the Island, making "interceptions" of the

insects found there, and thus greatly contributing to the records of hosts and abundance of the insects of Puerto Rico. Dr. Mortimer D. Leonard, at that time working at the Río Piedras Station, and Mr. A. S. Mills, of the F. H. B., published "A Preliminary Report on the Lima Bean Pod-Borer and Other Legume Pod-Borers in Porto Rico" (Jour. Ec. Ent., **24**(22): 466–473. Geneva, April 1931), and on "The Eggs of the Lima Bean Pod Borer in Porto Rico" (Jour. Ec. Ent., **24** (3): 663. Geneva, June 1931), describing the eggs on the leaves and blossom-buds.

Altho not nearly as abundant as two other "Lima Bean Pod-Borer Caterpillars of Porto Rico" (Jour. Dept. Agr. P. R. **17** (3): 241–255, fig. 6. San Juan, July 1933), "from the standpoint of extensive distribution and of quarantine restrictions at present in force," it "is of the greatest importance. It is present in Japan and many other regions of the old world, but only in Cuba and Puerto Rico of the new world, and specifically not in the United States. For that reason, since July 1, 1925, no beans in the pod can be exported from the West Indies to the United States, except during the winter, and only under special permit and inspection, thus to a considerable extent limiting production in the West Indies. Incidentally, these restrictions have been responsible for an intensive study of the insect in Cuba, where it is the most common pod-boring caterpillar. In Puerto Rico, *Maruca* is of only minor importance, not because it is less abundant than in Cuba, but because two other species are so much more abundant and cause much heavier losses. The caterpillars, after burrowing into the pod, have the habit of keeping an exit open to the outside, through which to void their excrement. (This habit is of value to the bean grower, for he is thus able to make sure of all infested pods, and eliminate them as culls when green beans are being prepared for shipment to distant markets.) They are generally of a creamy white and can most readily be distinguished by their spotted appearance, for they generally have four large black or dark grey spots on the back of nearly every segment. Sometimes the spots are not very dark, but usually they are quite distinct, and coupled with the presence of a frass-disposal hole to the outside of the pod, one can usually identify the caterpillar without difficulty." "Methyl Bromide Fumigation for Destruction of Pod Borer Larvae" (Jour. Ec. Ent., **33** (1): 176-9. Menasha, February 1940) conducted on the pier at San Juan by Mr. Randall Latta showed that it caused complete mortality at 0.5 pound per 1,000 cu. ft., at atmospheric pressure in a tightly closed container after two hours exposure at 70° F. temperature. The caterpillars have been found in the wild lima bean (*Vicia faba*), in pigeon peas (*Cajanus indicus*), and in sword beans (*Canavali maritima*), and these are possible alternative hosts for normal infestation in lima beans and string beans. Twenty-six interceptions had been made in lima beans up to 1936; at

Loiza, Río Piedras, Caguas, Cidra, Cayey, Bayamón, Vega Baja, Barceloneta, Arecibo and Isabela, and thirteen in string beans: at Río Piedras, Carolina, Caguas and Manatí. At the Mayagüez Station (1937-43) they were considered "a limiting factor in dry bean production," (1938-60) constituting "approximately 85 per cent of the entire borer population."

"The moth is very active, and when not flying about, stands with wings outspread and all ready to go. The forewings are chocolate brown, with a large white triangular spot on the front margin; the hind wings are silvery

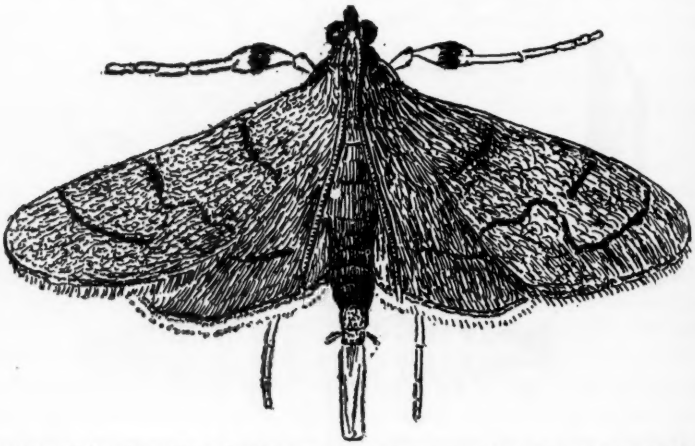


The Southern Beet Webworm, *Psara* (or *Pachyzancla*) *bipunctalis* (Fabricius): *a*, adult; *b*, caterpillar, both about three times natural size; *c*, lateral view of first proleg and abdominal segment of larva (incorrectly showing 2 setae on the pinnacula bearing setae iii and vi: there should be only one each, according to Mr. H. W. Capps); *d*, pupa, three times natural size, and cremaster at right showing location of hooks. (Bureau of Entomology, U. S. Dept. Agr.)

white with a spot" on the apical margin. Of them, Mr. E. G. Smyth collected thirty-four at light at Hda. Santa Rita, Guánica during the latter half of 1913, and they have also been taken at Bayamón and Río Piedras, Dr. Wm. Schaus (1940-365) noting additional collections at Lares, Aibonito and Coamo. Prof. Forbes notes its presence in Haiti, and widely in South America, confirming Herr Möschler's records from French and Dutch Guiana and Colombia to the Argentine. Apparently these records were overlooked in the economic account of distribution.

Psara bipunctalis (Fabricius) is by Dr. Schaus (1940-366) identified

with what Herr Heinrich B. Möschler had re-described from Surinam and Jamaica under the same *Botys terricolalis*, and this is the name used by Dr. Gundlach for his single female from Puerto Rico. Dr. Schaus had previously considered that *Botys detritalis* Guenée, as listed by them, was also in synonymy, and this is indicated in "Insectae Borinquenses" (1936-465). The caterpillar is a common webber of the leaves of "beets, chard and *Amaranthus*," and as a *Pachyzancla* is noted by Mr. Thos. H. Jones (1915-8), Dr. Richard T. Cotton (1918-280), and in Van Zwaluwenburg's list, P. R. 1438. Most surprisingly, "*Psara* has priority over *Pachyzancla*:" one instance of a short, simple name taking precedence over a longer and more complicated one. Of these light brown moths, with a few darker



Adult of the "Pega-Pega del Tabaco," *Psara periusalis* (Walker), six times natural size. (Drawn by G. N. Wolcott.)

spots and wavy lines on the wings, Mr. E. G. Smyth collected over fifty at light at Hda. Santa Rita, Guánica, during the latter half of 1913, and they have repeatedly been taken at light at Río Piedras and intercepted at Bayamón. When viewed at an angle the wings have a lavender iridescence. Adults were reared by Mr. E. G. Smyth at Rio Piedras from larvae on "rabo de gato" (*Achyranthes indica*), and, altho this seems unlikely, on "botoncillo" (*Borreria ocimoides*), as well as on such economic hosts as eggplant and pepper.

Psara periusalis (Walker), a smaller and darker brown moth, was identified by Dr. Harrison G. Dyar as a *Pachyzancla* for Mr. Thos. H. Jones, who (1915-9) noted that "the young larvae live at first as miners in the leaves (of eggplant and *Solanum torvum*), but later web the leaves together."

Dr. Richard T. Cotton in his "Report of the Assistant Entomologist" (in Ann. Rpt. Insular Expt. Station, 1916-17. San Juan 1917), calling it the "Tobacco Leaf-Folder," gives an extended account, with descriptions of all stages, life-history and control, on which is based his subsequent account (1918-299) as a leaf-folder on eggplant. Mr. J. M. Langston found that "The Tobacco Leaf-Folder of Porto Rico attacks Tomatoes in Mississippi" (Quarterly Bull. State Plant Board Miss., **2**(4): 7–9. A. & M. College, Mississippi, 1923). Locally it is called "el Pega-pega del Tabaco," being possibly the most abundant insect on shade-grown tobacco, but much less abundant on sunny hills and on tobacco grown in the open. To some extent, the caterpillars may feed on the leaves of the tomato, and on those of *Solanum torvum* and *Solanum nigrum*. The adults have been intercepted at light at Bayamón, and Mr. E. G. Smyth found them very abundant at Guánica, where he collected over a hundred of these "small dusky Pyralids" during the latter half of 1913. Dr. Schaus (1940-367) lists collections at Coamo, Lares and San Germán, but the insect is present in all parts of the Island, being possibly most abundant in the tobacco regions of the interior.

Psara phaeopteralis (Guenée), considered by Dr. Schaus (1940-286) to be what Herr Heinrich B. Möschler (1890-286) described as *Botys intricatalis*, and which Dr. Gundlach thus listed, is specifically and almost exclusively a pest of St. Augustine grass or "grama" (*Stenotaphrum secundatum*). Caterpillars have been noted defoliating this grass at Río Piedras, Santurce, Hatillo, Isabela and Aguirre, but Dr. Mortimer D. Leonard (1932-133) notes that "adults and larvae were also abundant during June in large patches of a weed, "siempreviva" (*Gomphrena globosa*) at El Morro in San Juan:" the only record on any other host than grama. The little brown moths, intermediate in depth of coloration between the other two local species of *Psara*, have been taken at light at Río Piedras, intercepted at Bayamón repeatedly, and at Dorado and Manatí, while Dr. W. A. Hoffman found them at El Semil, Villalba, and Prof. J. A. Ramos (1947-50) on Mona Island. Presumably the insect occurs wherever its host is present, Dr. Schaus (1940-366) noting ten localities at which it has been collected including Aguirre and Ensenada. Most outbreaks on lawns or pastures start in the shade of trees, but before the outbreak has run its course spreads to areas in full sunshine, shaded by trees at no time of day. No parasite of the caterpillars has been reared, but when they have defoliated a section of grass the naked grass stems offer them little protection from grackles and blackbirds, or any other birds that will descend to the ground to eat caterpillars, and both toads and lizards have been observed feeding on them at Isabela.

Prof. Forbes notes the fringe of the hind wing of *phaeopteralis* is all dark, while that of the adult of *periusalis* is tipped with white.

Loxostege bifidalis (Fabricius) was listed from Puerto Rico by Herr Möschler and Dr. Gundlach under the name *Eurycreon evanadalis* Berg, and as a *Phyctaenodes* was identified by Dr. Harrison G. Dyar for inclusion in Van Zwaluwenburg's list: P. R. 1407, and in "Insectae Borinquenses" (1936-466). Mr. E. G. Smyth found this "common buff Pyralid" very abundant at light at Hda. Santa Rita, Guánica, for during the latter half of 1913 he collected 167 individuals, but he did not discover the host of the larvae. It is primarily an inhabitant of the xerophytic regions of the Island, Dr. Schaus (1940-368) listing additional collections at Aguirre, Coamo, Arecibo and San Juan, and on Vieques Island, but it has not been intercepted at light at Bayamón or found at Río Piedras. It is a small, dull cream-colored moth, with broad darker bands on the forewings.

Loxostege nudalis (Hübner), listed by Herr Möschler and Dr. Gundlach as introduced from Spain into Puerto Rico, has not since been found locally.

Loxostege stolidalis was described by Dr. Wm. Schaus (1940-368) from a male from Ensenada, others from Coamo, with a wingspread of 20 mm., mostly buff in color; "markings extremely faint" on the forewings.

Loxostege similalis (Guenée) is considered by Dr. Schaus (1940-367) to be what Herr Heinrich B. Möschler (1890-290) described from a single male, collected in Puerto Rico by Dr. Gundlach, under the name of *Eurycreon collucidalis*. Mr. E. G. Smyth collected 26 adults of this "buff barred Pyralid," identified by Dr. Harrison G. Dyar as a *Phlyctaenodes*, at light at Hda. Santa Rita, Guánica, during the latter half of 1913, and Dr. Schaus records additional collections at San Germán, Guayanilla, Coamo and from Vieques Island. Prof. J. A. Ramos (1947-50) found many specimens, as determined by Prof. Wm. T. M. Forbes, at light on July 20, 1944, Sardinera Beach, Mona Island.

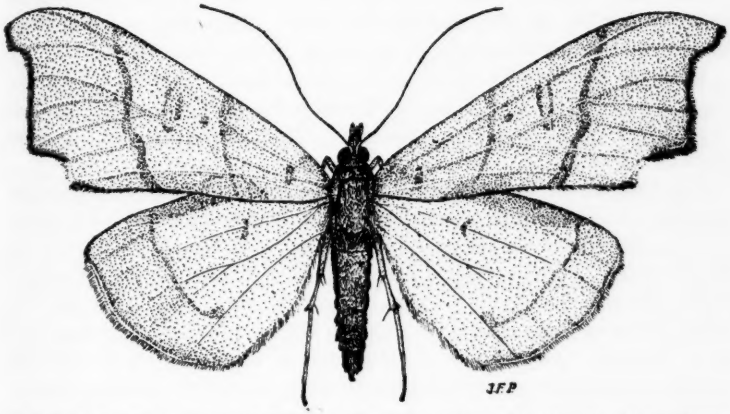
Diasemia ramburialis (Duponchel), of which Herr Heinrich B. Möschler described from two specimens collected in Puerto Rico by Dr. Gundlach the variety *minimalis* (1890-306), is "universally distributed" according to Dr. Schaus (1940-369), and "in the U. S. National Museum there are specimens from Florida, Panama, French Guiana, South Brazil, Argentina and Jamaica all representing the var. *minimalis* Möschler." Adults have been intercepted at light at Bayamón, and collections made at Cataño, Coamo and on El Yunque.

Sparagmia gigantalis Guenée was listed by Herr Möschler and Dr. Gundlach from Puerto Rico, and it has twice since been collected at Lares, and once intercepted at light at San Juan. The caterpillar feeds on "yagrumo" (*Cecropia peltata*) and spins an extensive cocoon of brownish silk. The adult is a large, dark orange moth, its forewings twice deeply cleft on the

outer margin and with two darker transverse narrow bands; a fainter one on the hind wing; a pinkish iridescence at certain angles on areas of both wings.

Tholeria reversalis (Guenée) was re-described as the variety *hilaralis* of *Botys* (*Mecyna*) *polygonalis* Hübner by Herr Heinrich B. Möschler (1890-283). It is not represented in recent collections from Puerto Rico.

Cybalomia evincalis was described as a *Botys* by Herr Heinrich B. Möschler (1890-287) from a single male collected in Puerto Rico by Dr. Gundlach, and listed by him. It has since been found in Cuba but not in Puerto Rico.



Adult of the Yagrumo Leaf-Webber, *Sparagmia gigantalis* Guenée, three times natural size. (Drawn by José F. Pietri.)

Udea rubigalis (Guenée) as identified by Mr. Carl Heinrich, the celery leaf tier or the greenhouse leaf tier of continental United States, was intercepted as larvae eating the leaves of string beans at San Juan in 1931.

Condylorrhiza vestigialis (Guenée), as identified by Mr. Hahn W. Capps, was collected at light at Villalba, May 19, 1940, by Dr. Luis F. Martorell. This is continental species of which the larva feeds on willow. The adult is an intensely yellow moth, with a faintly darker pattern on the wings.

Hapalia albipunctalis (Dognin) as identified by Mr. Carl Heinrich was collected by Dr. W. A. Hoffman at light at El Semil, Villalba, May 10, 1940.

Hapalia ? concinnalis was described by Herr Heinrich B. Möschler (1890-287) from two females collected in Puerto Rico by Dr. Gundlach and a pair in the Staudinger collection as a *Botys*, and it is thus listed by Dr. Gundlach. Dr. Schaus (1940-371) admits that "I have not been able to identify it in any material that I have seen."

Hapalia eupalusalis (Walker) is listed by Dr. Schaus (1940-371) from Coamo, Lares, Utuado and El Yunque.

Hapalia vinotinctalis (Hampson) is listed by Dr. Schaus (1940-371) from Coamo and Bayamón. Prof. Forbes notes additional collections at Cayey, and at Lares by Mr. Francisco Seín.

Botys ? flammeolalis is described by Herr Heinrich B. Möschler (1890-289) from a single female collected by Dr. Gundlach in Puerto Rico as "ein eigentümliches Tier," with wingspread of 6.3 mm. Despite the valiant effort made by Dr. Schaus to place in their proper genus all the Pyralids described by Herr Möschler in the catch-all genus of *Botys*, of doing so for this one he confesses his failure: "My notes made in Berlin placed this species doubtfully as belonging in the Nymphulinae."

Pyrausta albifrontalis, described as a *Botys* by Herr Heinrich B. Möschler (1890-284) from a single male collected in Puerto Rico by Dr. Gundlach, and thus listed by him, is recognized by Dr. Schaus (1940-374): a female from Guánica.

Pyrausta cardinalis (Guenée) was listed as a *Botys* by Herr Möschler and Dr. Gundlach from Puerto Rico. Dr. Schaus (1940-376) lists subsequent collections from Lares, Aibonito, Arecibo, Coamo, Río Piedras and El Yunque. It is a cardinal red except for black antennae, eyes, the broad outer margin of the hind wings, a narrow outer margin of the forewings and a single oval spot towards the apex. Mr. S. S. Crossman found it at Aibonito, and Dr. Luis F. Martorell at Villalba. The Cornell University collection has specimens from Cayey, Toa Alta and Mayagüez.

Pyrausta cerata (Fabricius) was listed from Puerto Rico as *Botys oedipodalis* Guenée by Herr Möschler and Dr. Gundlach, and is in Van Zwaluwenburg's list (P.R. 1411) as *Pyrausta mellinalis* Hübner, identified by Dr. Harrison G. Dyar for Mr. E. G. Smyth, who collected a hundred adults at light at Hda. Santa Rita, Guánica, during the latter half of 1913. In "Insectae Portoricensis" (1923-193), using the name *Epicorsia mellinalis* Hübner, the caterpillar, abundant on "higüerillo" (*Vitex divaricata*) and "péndula" (*Citharexylum fruticosum*), is described, and the three-layered cocoon which it forms in a folded-over leaf of the host tree. The caterpillars are so abundant during some years that one can hardly find anywhere on the Island, a single uninfested tree and most of them are so heavily attacked as to be conspicuous as one drives along the road. Possibly the most widespread outbreak was that of the autumn of 1937, but that noted at only Aibonito and Río Piedras in February 1923 may have been quite as extensive. That of the autumn of 1940, noted in "Trees for Roadside Planting in Puerto Rico" (Caribbean Forester, **6** (3): 115–129, fig. 3. Río Piedras, April 1945) was checked for all parts of the Island: from Cabo Rojo to Isabela, from Patillas to Fajardo, and at numerous intermediate

points. At San Sebastián, Dr. Luis F. Martorell found the eggs, very light green in color, oval, flattened and overlapping, laid on a péndula leaf. The adults are large creamy yellow moths, with a wing expanse of 40 mm., the costal margin of the fore wings brown, and the outer margins of both and sometimes on the abdomen a dorsal stripe in brown.

Pyrausta eupalusalis (Walker), as identified by Mr. Carl Heinrich, is a little iridescent yellowish moth, with darker outer margins on its wings and a faint darker pattern, collected by Dr. W. A. Hoffman at light at El Semil, Villalba, May 10, 1941.

Pyrausta episcopalis (Herrich-Schäffer) was listed as a *Botys* from Puerto Rico by Herr Möschler and Dr. Gundlach, and Dr. Schaus records more recent collections at Lares, Adjuntas, Aibonito and on El Yunque.

Pyrausta gentillalis was described by Dr. Wm. Schaus (1940-373) from a single male from San Juan, with a wing expanse of 13 mm., the "fore wing purplish vinaceous, the costa very narrowly, the termen and inner margins more broadly golden yellow."

Pyrausta glirialis (Herrich-Schäffer), originally described from Cuba, is reported as a *Botys* from Puerto Rico by Herr Möschler and Dr. Gundlach. Dr. Schaus (1940-375) notes an additional collection at Coamo.

Pyrausta gracilalis (Herrich-Schäffer), originally described from Cuba, is listed as a *Botys* from Puerto Rico by Herr Möschler and Dr. Gundlach. It has since been found at Arecibo and Coamo, according to Dr. Schaus (1940-376).

Pyrausta illutalis (Möschler) mis-identified, according to Dr. Schaus, by Herr Möschler (1890-295) from Puerto Rico under the name of *Condyllorrhiza illutalis* Guenée of Brasil, was listed under this name by Dr. Gundlach. Dr. Schaus (1940-374) notes a specimen from Puerto Rico in the U. S. National Museum which he considers "possibly the same as *P. illutalis* (Möschler)."

Pyrausta insignitalis (Guenée) is listed from Puerto Rico as a *Botys* by Herr Möschler: a single specimen collected by Dr. Gundlach. Dr. Schaus (1940-376) notes another from Arecibo.

Pyrausta laresalis was described by Dr. Wm. Schaus (1940-374) from a single female from Lares with a wing expanse of 22 mm., "fore wing olive buff with dark suffusions and irrorations not well defined."

Pyrausta oculatalis was described as a *Botys* by Herr Heinrich B. Möschler (1890-282) from a male and three females collected by Dr. Gundlach in Puerto Rico and listed by him. Dr. Schaus (1940-373) lists "a male in the U. S. National Museum from an old Puerto Rican collection."

Pyrausta phoenicealis (Hübner) was listed as a *Botys* from Puerto Rico by Herr Möschler and Dr. Gundlach. Mr. E. G. Smyth reared larvae at Río Piedras from "marubio botón" (*Hyptis capitata*), several of which were

parasitized by either a black or a yellow Braconid, and others transformed to adults which were identified by Dr. Schaus. This little orange-yellow moth, with somewhat darker broad markings, has been repeatedly intercepted at light at Bayamón, and Dr. Schaus (1940-375) considers it "universally distributed," listing collections at nine Puerto Rican localities.

Pyrausta phyllidalis was described by Dr. Wm. Schaus (1940-373) from a female from Cuba, another from Coamo, with a wing expanse of 28 mm., the thorax, abdomen and legs white, elsewhere orange cinnamon; "fore wing white; costal margin deep chrome at base; markings pale ecru drab." Prof. Forbes collected caterpillars at Coamo in the folded-over leaf of milkweed, *Asclepias curassavica*, which were reared to adult.

Pyrausta tyralis (Guenée) was identified by Herr Möschler and listed by Dr. Gundlach as *Botys diffisa* Grt. & Rbs.: a single female in the Krug collection from Puerto Rico. It has not since been found locally.

Pyrausta viscendalis was described as a *Botys* by Herr Heinrich B. Möschler (1890-285) from a single female collected in Puerto Rico by Dr. Gundlach and listed by him. It has not since been found anywhere.

Pyrausta votanalis was described by Dr. Wm. Schaus (1940-374) from a single female from Pueblo Viejo, with a wing expanse of 10 mm., "palpi, head and thorax ecru drab; abdomen cinnamon buff; fore wing chiefly reddish purple," reared from caterpillars feeding on "molinillo" (*Leonotis nepetaefolia*).

Microtheoris ophionalis (Walker) is listed from Puerto Rico by Dr. Wm. Schaus (1940-377): specimens from Santurce and Aguirre.

Noctuelia thalialis (Walker), as identified by Mr. E. G. Smyth by comparison with illustration in Holland's "Moth Book" (later confirmed by Dr. Schaus), is a "tiny barred Pyralid" of which he collected 160 individuals at light at Hda. Santa Rita, Guánica, during the latter half of 1913. Dr. Schaus (1940-377) lists collections at Aguirre, Aibonito, Coamo, Tallaboa, San Germán and Isabela. The distal third of both wings is brown, as is the base of the forewings, and an intermediate costal area of varying intensity that may reach the inner margin. This is P. R. 1412 in Van Zwaluwenburg's list. Considering how abundant the moths are in the more xerophytic regions of the Island it is rather surprising, as Dr. Schaus remarks, that he "can find nothing in Möschler to agree with this species," and possibly indicates, according to Prof. Forbes, that Herr Möschler mistook it for a Noctuid. Adults have been collected at Palmas Abajo by Dr. W. A. Hoffman, and on Vieques Island by Prof. Forbes.

Mr. H. W. Capps notes this a synonym for **Noctuelia rufofascialis** (Stephens).

Stenoptycha metagrammalis was described as a *Lineodes* by Herr Heinrich B. Möschler (1890-305) from a pair collected in Puerto Rico by Dr.

Gundlach and listed by him. Dr. Schaus (1940-378) lists subsequent collections from the Island of Vieques, and from Río Piedras, Aibonito, Coamo and Adjuntas.

Stenoptycha serpentifera Hampson, originally described from the Bahamas and Cuba, is identified by Dr. Schaus (1940-378) from Puerto Rico: specimens from Coamo.

Lineodes gracilalis Herrich-Schäffer is listed from Puerto Rico by Herr Möschler and Dr. Gundlach, but no specimen has been found locally since the male collected by Dr. Gundlach which Herr Möschler re-describes at length.

Lineodes triangulalis was described by Herr Heinrich B. Möschler (1890-305) from three specimens collected in Puerto Rico by Dr. Gundlach and listed by him. It has not since been found locally.

Subfamily Nymphulinae

Argyractis doriscalis is described by Dr. Wm. Schaus (1940-379) from a female intercepted at light at Bayamón with a wing expanse of 15 mm., mostly "citrine drab" in color, patterned on both wings.

Argyractis plusialis (Herrich-Schäffer) was listed from Puerto Rico by Herr Möschler, identifying several specimens collected by Dr. Gundlach as *Cataclysta angulatalis* Lederer. A more recent collection has been made at Coamo, according to Dr. Schaus (1940-380), who neglects to mention his identification of this little grey-brown, sharply patterned Pyralid for Mr. E. G. Smyth, who took 25 of them at light at Hda. Santa Rita, Guánica, during the latter half of 1913, and thought them "rather common." Prof. Forbes found adults common at Coamo, and collected a few on Vieques Island. The larvae of continental species of this genus live in cases attached to stones in swift water.

Nymphula fluctuosalis Zeller, as identified by Prof. Wm. T. M. Forbes, is mentioned by Don Julio García-Díaz (1938-54) as being attacked by the dragonfly *Lepthemis vesiculosa* (F.), at Tortuguero Lagoon during February and March, when "these small white swamp moths were very abundant. These moths flew very low over the water surface, among the emerging aquatics, and so were in part protected from *Lepthemis*."

Nymphula hermeasalis (Walker) is listed by Dr. Schaus (1940-381) from Lares and Coamo, and Dr. W. A. Hoffman collected it at light at El Semil, Villalba.

Nymphula infirmalis (Möschler), described originally as a *Paraponyx* from Jamaica, was identified by its describer for Dr. Gundlach as the two males which he had collected in Puerto Rico. It has not since been found anywhere.

Nymphula rugosalis was described as a *Paraponyx* by Herr Heinrich B.

Möschler (1890-318) from a pair collected in Puerto Rico by Dr. Gundlach and thus listed by him. Prof. Wm. T. M. Forbes identified this species from Laguna Tortuguero for Don Julio García-Díaz (1938–96), and notes collections from Toa Alta and Aguirre. Dr. Schaus (1940–381) lists collections at Coamo and Río Piedras, noting that it is "closely allied to *N. fluctuosalis* Zeller."

Cataclysta bromachalis is described by Dr. Wm. Schaus (1940-382) from a male taken at San Juan which has a wing expanse of 15 mm., "head light pinkish cinnamon; thorax brown, the patagia creamy white; abdomen drab grey with fuscous segmental lines; fore wing silvery, costal margin grayish."

Cataclysta miralis was described by Herr Heinrich B. Möschler (1890-319) from two males and a female collected in Puerto Rico by Dr. Gundlach, and listed by him. Subsequent collections have been made at Lares, Adjuntas, Aibonito, Jájome Alto and on El Yunque, according to Dr. Schaus (1940-381), and Dr. W. A. Hoffman collected some of these striking little moths at El Semil, Villalba and at Utuado. They do not exclusively live in the mountains, however, for they have been intercepted at light at Bayamón and found resting on vegetation in the daytime at San Juan and at Trujillo Alto. The outer margin of their hind wings is a series of small black spots with iridescent golden centers; their fore wings have each four large oval white areas margined in dark brown on a lighter brown background. Prof. Forbes found them especially abundant on El Yunque.

Cataclysta minimalis H. S. is listed by Dr. Stahl.

Cataclysta moniligeralis Lederer was identified as an *Argyractis* by Dr. Schaus (1940–380) from material intercepted at light at Bayamón.

Cataclysta sumptuosalis was described by Herr Heinrich B. Möschler (1890–319) from several specimens collected in Puerto Rico by Dr. Gundlach. Dr. Schaus as an *Argyractis* (1940–380) lists collections at Lares, Maricao, Adjuntas, Coamo, Aibonito, Manatí and Jájome Alto, and Don Julio García-Díaz (1938-96) lists it as a fresh water insect.

Cataclysta opulentalis Lederer was listed from Puerto Rico by Herr Möschler and Dr. Gundlach, but has not since been found locally.

Cataclysta vestigialis Snellen, listed from Puerto Rico by Herr Möschler and Dr. Gundlach, is considered by Dr. Schaus (1940-382) to be a misidentification.

Ambia mineolalis was described by Dr. Wm. Schaus from specimens collected on El Yunque, the male having a wing expanse of 14 mm., the female 16 mm., "palpi, head and body white; a small orange spot on tegula, and transverse line on third segment of abdomen; fore wing white; costa narrowly maize yellow (with) dark points."

Bradina hemmingalis Schaus, originally described from Jamaica, is recognized by its describer (1940-384) from El Yunque.

Diathrausta yunquealis was described by Dr. Wm. Schaus (1940-384) from adults of both sexes collected by Dr. Wm. T. M. Forbes on El Yunque. The wing expanse of the male is 14 mm., that of the female 17 mm.; brown moths, marked with white, often edged with black.

Stenia aguirrealis was described by Dr. Wm. Schaus (1940-385) from a male at Aguirre with a wing expanse of 10 mm.; "head and collar white with grayish irrorations; wings with pale ochreous irrorations." The Cornell University collection contains the type, of which Prof. Forbes can note no difference from *Bocchoris acutangulalis*.

Stenia declivalis indianalis (Dyar) is listed by Dr. Schaus (1940-385) from Culebra Island, and from San Germán, Ensenada, Coamo and Palmas Abajo (between Guayama and Jájome Alto) in Puerto Rico.

Stenia pellucidalis was described as *Somatania* by Herr Heinrich B. Möschler (1890-301) from four specimens collected by Dr. Gundlach in Puerto Rico, and listed by him. This moth has not since been found locally, but Dr. Schaus (1940-385) records it from Cuba.

Piletocera bufalis (Guenée), re-described under the name *Penestola praeficalis* by Herr Heinrich B. Möschler (1890–316) from several specimens collected in Puerto Rico by Dr. Gundlach, is listed by Dr. Schaus (1940–386) from both Culebra and Vieques Islands, and from Cataño, Dorado and Ensenada in Puerto Rico.

Odilla noralis was described by Dr. Wm. Schaus (1940-387) from a male from Adjuntas with a wing expanse of 16 mm., "head and thorax vinaceous buff; fore wing apricot buff; hind wing whitish."

Subfamily Scopariinae

Elusia enalis was described by Dr. Wm. Schaus (1940-388) from a number of small moths (wing expanse 8 mm.) from El Yunque, Jájome Alto and Lares, with "head and thorax gray mottled with fuscous; fore wing whitish with dark patches," the markings varying "considerably in the different specimens."

Subfamily Chrysauginae

Salobrena recurvata was described as a *Ballonicha* from Jamaica by Herr Möschler, and listed by him and Dr. Gundlach from Puerto Rico, but has not since been found here.

Carcha hersilialis Walker, according to Dr. Schaus (1940-389), was re-described by Herr Heinrich B. Möschler under the name of *Thalpochares basalis* for the female (1890-169) and as *Coeloma tortricalis* for the male (1890-277), both names being listed by Dr. Gundlach. These little moths have been repeatedly intercepted at Bayamón at light, and were found by Dr. W. A. Hoffman at El Semil, Villalba, May 10, 1941, while Dr. Schaus

notes additional collections at Palmas Abajo, Coamo and Lares. The basal third of the fore wing is dark brown, the median third whitish, the distal third light brown, as is also the hind wing.

Caphys bilinea Walker was re-described from Puerto Rico: two females in the Krug collection, by Herr Heinrich B. Möschler (1890-275) under the name of *Callasopia rosealis*, and it is thus listed by Dr. Gundlach. Dr. Schaus (1940-389) notes a recent collection on El Yunque.

Bonchis munitalis (Lederer) is listed from Puerto Rico as an *Ethnistis* by Herr Möschler and Dr. Gundlach. The queer little brown moths with expanded legs, the tips of the fore wings turned in, have been reared twice at Río Piedras from the seed pods of "roble" (*Tabebuia pallida* or *Tecoma pentaphylla*) and again at San Sebastián in October 1939 from the same host, when all the pods appeared to be infested with the caterpillars. Dr. Schaus (1940-390) lists an additional collection at Aguirre, and presumably the insect will occur wherever its specific host grows. Over half of the fore wing is a black-centered but poorly-developed eye-spot; the base is dark brown, as is also the hind wing and the body of the moth.

Pachymorphus subductellus was described by Herr Heinrich B. Möschler (1890-278) from a single male collected in Puerto Rico by Dr. Gundlach, and listed by him. Mr. Thos. H. Jones found the larvae boring in twigs of "roble" (*Tabebuia pallida* or *Tecoma pentaphylla*) at Río Piedras in the spring of 1912, and reared the large-snouted, dull purplish-pink adults, as determined by Dr. Schaus. Subsequent rearings from this host at Río Piedras were made in March 1923, and adults found at light in September 1922, intercepted at Bayamón, and reported by Dr. Schaus (1940-390) at Cataño, Aibonito, Coamo and San Germán. This and the preceding species are as different in size and general appearance as can well be imagined, and it is merely by the accident of systematic listing that two moths, the larvae of which happen to feed on the same host, should be placed together.

Epitamyra albomaculalis was described as a *Tamyra* by Herr Heinrich B. Möschler (1890-278) from a single female collected in Puerto Rico by Dr. Gundlach, and listed by him. It has since been found in Cuba but not in Puerto Rico.

Streptopalpia minusculalis was described as a *Tamyra* by Herr Heinrich B. Möschler (1890-278) from three females collected in Puerto Rico by Dr. Gundlach, and listed by him. Dr. Schaus (1940-391) lists a subsequent collection at San Germán. The Cornell University collection has specimens from Cataño, Río Piedras and Aguirre, in addition to those collected by Prof. Forbes on Vieques Island.

Subfamily Endotrichinae

Perforadix sacchari was described by Mr. Francisco Seín as "The Sugar-Cane Root Caterpillar and other new Root Pests in Puerto Rico" (Jour. Dept. Agr. P. R., **14** (3): 167–191, pl. 10. San Juan, August 1930), having been previously reported as *Sulfetula grumalis* Schaus, as identified by Dr. Harrison G. Dyar. Mr. Seín found larvae boring in the root-tips of sugar-cane at Río Piedras and elsewhere in Puerto Rico, and in Santo Domingo, specific locality records being at Adjuntas, and of adults intercepted at light at Bayamón, and recorded by Dr. Schaus (1940-392) at Coamo and Isabela, and on Vieques Island. Mr. Harry A. Beatty found it on St. Croix, and it will doubtless be found in others of the Lesser Antilles where sugar-cane is grown. Mr. Seín's observations were summarized by Dr. M. D. Leonard (1931–112 and 1931–144), and in "An Economic Entomology of the West Indies," pages 156 to 158.

Micromastra isoldalis was described by Dr. Wm. Schaus (1940-393) from specimens collected on El Yunque, at Jájome Alto and San Germán, the males with a wing expanse of 8 mm., the females 9 mm., thorax and base of abdomen mostly white; wings white with fine grey irrorations, head and markings light drab.

Subfamily Pyralinae

Pyralis manihotalis Guenée, originally described from Java, was listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Asopia gerontesalis* Walker, but without indication of its economic role. Dr. Richard T. Cotton reared it from larvae feeding on corn meal and on rice, for it is a pest of stored products altho not of great importance. The dirty brown moths have two wavy lines on both wings.

Herculia dissimilalis was described as *Parasopia* by Herr Heinrich B. Möschler (1890-276) from three specimens collected in Puerto Rico by Dr. Gundlach, and listed by him. Dr. Schaus (1940-394) notes subsequent collections at Lares and San Germán. Mr. Carl Heinrich identified as *Herculia psammioxantha* Dyar the adults which Dr. W. A. Hoffman found at light at El Semil, Villalba, on May 10, 1941: inconspicuous greenish-yellow moths with two narrow, curved, transverse lines across the wings. In the late autumn of 1938, the baled alfalfa hay at the Isabela Substation, in which Mr. L. A. Serrano took such pride, was greatly disfigured by the numerous white, thin but dense cocoons of caterpillars which had spun webs over it, in which their excrement was entangled. The injury was really not serious, as comparatively little of the hay was actually eaten, but its appearance was ruined, and Mr. Serrano began to doubt its palatability

for cattle. To the reared adults Mr. Heinrich applied the Dyar name, although considering it in probable synonymy with what Möschler had described from Puerto Rico. It may be presumed that the insect is endemic, although it is doubtful if the larvae of the adults which Dr. Gundlach collected had fed on alfalfa hay.

Subfamily Galleriinae

Galleria mellonella (Linneaus), the wax moth of bee hives, or "traza" as it is called locally, was listed from Puerto Rico by Herr Möschler and Dr. Gundlach, but without comment. Adults have been intercepted at light at Bayamón, and Mr. Francisco Seín records an infestation at Lares which had destroyed several colonies, but we have no data on abundance on whether it is a really serious pest of wide distribution.

Achroia grisella (Fabricius), as identified by Mr. Aug. Busck, is a small brown moth which Mr. Francisco Seín found very abundant at Río Piedras in June 1925, tunneling thru the comb of which the honey had been centrifuged out, forming dark-colored silk tubes. The comb had been out in the open for some time, near the hive, resting on the ground. This is the "lesser wax moth" of apiaries, and altho present in Puerto Rico is apparently not abundant.

Corcyra cephalonia (Stainton) was first reported from Puerto Rico by Dr. F. H. Chittenden, writing of "The Rice Moth" (Bulletin No. 783, pp. 1–15. U. S. D. A., Washington, D. C., July 14, 1919), of which the eggs were laid in sacks of cereals, the larvae abundant in rice, and also reared from chocolate. Dr. Richard T. Cotton found larvae attacking dry garbanzos or chick peas at Río Piedras, and Mr. Miguel A. Diaz noted them in sesame, with the seeds webbed together to form tunnels and cocoons. Dr. Luis F. Martorell reared adults from larvae in pods of "bayahonda" (*Prosopis juliflora*) at Guánica in January 1914, and they had previously been intercepted in tamarind pods at Guánica, and in bean pods and cotton seed cake at San Juan. The brownish, oval-winged adults have been intercepted at light at Bayamón.

Subfamily Macrothecinae

Pogrima palmasalis was described by Dr. Wm. Schaus (1940-396) from a male collected by Dr. W. A. Hoffman at Palmas Abajo, between Guayama and Jájome Alto. It has a wing expanse of 12 mm., the wings silvery white with pattern in black, the abdomen white; "thorax wood brown; palpi, collar and tegulae vinaceous buff; head pale drab gray."

Genopaschia protomis Dyar, as determined by Mr. Carl Heinrich, was reared by Mr. Mario E. Pérez at Río Piedras from the base of a pineapple fruit. "This is strictly a pineapple insect" writes Mr. C. F. W. Muesebeck

under date of September 10, 1948, "but it is a predator that sometimes feeds on mealybugs occurring on pineapple."

Pseudotricha irenealis was described by Dr. Wm. Schaus (1940-397) from a male from Coamo, mostly brown in color with a wing expanse of 10 mm. Prof. Forbes has additional specimens from Isabela.

Subfamily Crambinae

Crambus biguttellus Forbes, originally described from Louisiana, is listed by Dr. Schaus (1940-398) from Maricao, Jájome Alto and El Yunque.

Crambus discludellus was described by Herr Heinrich B. Möschler (1890-323) from a single male collected in Puerto Rico by Dr. Gundlach, and listed by him. Dr. Schaus (1940-398) lists additional collections at Lares, Aibonito, Cayey, Jájome Alto and El Yunque.

Crambus domingellus Schaus, was doubtfully identified by Herr Möschler as *Crambus ? ligonellus* Zeller from a single male collected by Dr. Gundlach in Puerto Rico. Originally described from Santo Domingo, its describer (1940-398) identifies it from Puerto Rico: specimens from Lares.

Crambus fissiradiellus Walker was re-described by Herr Heinrich B. Möschler under the name *Crambus gestatellus*, from two males and a female collected in Puerto Rico by Dr. Gundlach. Dr. Schaus (1940-399) lists collections at Lares, Arecibo, Manatí, Coamo, Aguirre and San Germán, as well as from the Island of Vieques. Prof. J. A. Ramos (1947-50) collected two specimens at light on Mona Island.

Crambus ligonellus Zeller was re-described by Herr Heinrich B. Möschler (1890-322) as *Crambus detomatellus* from six males collected in Puerto Rico by Dr. Gundlach, and listed by him. Dr. Schaus (1940-398) lists collections at seven Puerto Rican localities and from Vieques Island. Mr. H. K. Plank found its larvae causing minor "Grassworm Injury to Lawns in Puerto Rico" (Tropical Agriculture **24** (1–3): 7–8, ref. 2. Port-of-Spain, Trinidad, January 1947) on Manila grass, *Zoysia maturella* (L.) Merr. More recently its dark, spotted caterpillars have completely defoliated entire lawns of this grass at Río Piedras, apparently indicating that this newly-introduced grass is a much more acceptable host than any native or naturalized grass previously present on the Island. When fully-grown, the caterpillars construct tough, spindle-shaped cocoons of dark silk, in the outer threads of which are entangled many short bits of grass and excrement. The moths are silvery grey in color, the forewings lavender with the venation outlined in dull orange or yellow; a narrow, doubly-curved darker band across the middle and another paralleling the outer margin inside a line of three conspicuous black spots towards humeral angle, and four others much smaller and less noticeable.

Crambus moeschleralis was named by Dr. Wm. Schaus (1940-398) from

numerous specimens from Cuba, Hispaniola and Puerto Rico of which Mr. Carl Heinrich described the genitalia of both sexes. This species was listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Crambus quinquareatus* Zeller, and identified by Dr. Harrison G. Dyar as *Crambus hastiferellus* Zeller, as recorded in "Insectae Borinquenses" (1936-471), adults resting on sugar-cane at Manatí.

Crambus profanellus Walker is identified by Dr. Wm. Schaus (1940-399) from the Island of Vieques, and from Manatí, Arecibo, Lares, San Germán, Coamo and Aguirre in Puerto Rico.

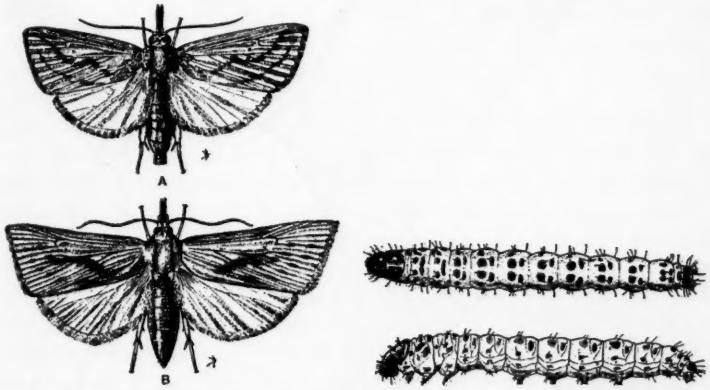
Crambus santiagellus Schaus, originally described from Cuba, is identified by the describer (1940-398) from Coamo and Aguirre, and from Vieques Island. Prof. J. A. Ramos (1947-50) collected one specimen at light on Mona Island.

Argyria diplomachalis Dyar, originally described from Panama and Cuba, is quite common in Puerto Rico, Dr. Schaus (1940-401) listing it from nine localities and from the Island of Vieques. He considers that "this is the *A. nivalis* (Drury) of Möschler, (of which Dr. Gundlach had one male). *Argyria nivalis* (Drury) may occur in Puerto Rico, as it is found in Cuba and Jamaica." It is a little silvery white moth with a brown triangle on costa of the fore wing, approaching the apex, and the outer margin brown.

Argyria lacteella (Fabricius) is listed from Puerto Rico by Herr Möschler under the name *Argyria lusella* Zeller, of which Dr. Gundlach had "ein Parr, welches Snellen nach von Zeller selbst bestimment Stücken mir bestimmte." Dr. Schaus (1940-400) lists it from San Germán, Mayagüez, Aibonito and El Yunque, and from Vieques Island. Presumably his record from Naguabo is what was intercepted at Juncos and identified by him as *A. opposita* Zeller. Apparently it is quite common, for the Cornell University collection has specimens from Cataño, Río Piedras, Santurce, Jájome Alto and Lares. Prof. Forbes notes that it is but half the size of *Argyria nivalis*.

Diatraea saccharalis (Fabricius) was listed from Puerto Rico by Herr Möschler and Dr. Gundlach under the name *Diatraea obliteratella* Zeller, the latter noting "había varios ejemplares en la colección de Krug," without any indication of the host of the larva or its economic importance. It is the lesser sugar-cane moth stalk-borer of the Americas, commonly known as "sugar-cane borer" according to its designation in the "Common Names of Insects Approved by the American Association of Economic Entomologists" (Jour. Ec. Ent., **39** (4): 427–448. Menasha, August 1946). At the time that Dr. Gundlach visited Puerto Rico the value of the coffee exported equalled and often exceeded that of the sugar produced, yet sugar-cane was grown at Hormigueros, Mayagüez and Añasco, and it seems surprising that he should not have collected the moth in person. To be sure,

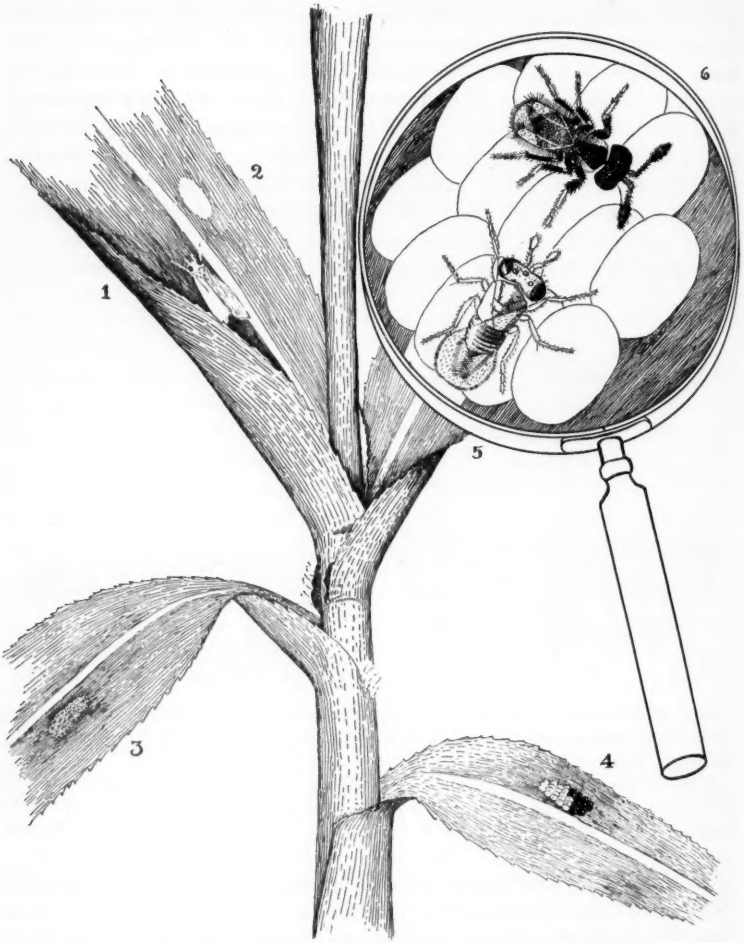
it is most retiring in the cane field during the daytime, but often comes to light at night, not only in cane regions but up in the mountains, as at El Semil, Villalba, and at Treasure Island, Cidra, and even on Mona Island, where no cane is grown. Mr. August Busck (1900-89) noted the larvae boring in stalks of sugar cane. "The annual cutting and crushing the cane with all living larvae and pupae naturally keeps the pest in check, but the remaining roots and single canes always contain enough individuals to infest the next year's growth." One of the earliest recommendations for control, and one that is still effective, so far as it goes, was made by Mr. D. W. May, Director of the Mayagüez Station, (1906-10) that "seed-cane



Left. Male adult of the Lesser Sugar-Cane Moth Borer, *Diatraea saccharalis* (Fabricius), above, female below, natural size. (Drawn by Harry Bradford. After Holloway, Haley & Loftin, Bureau of Entomology, U. S. D. A.)

Right. Caterpillars of the Lesser Sugar-Cane Moth Borer, *Diatraea saccharalis* (Fabricius), viewed from above and from the side, natural size. (Drawn by Harry Bradford. After Holloway, Haley & Loftin, Bureau of Entomology, U. S. D. A.)

be soaked twenty-four hours before planting to destroy (the larvae)." Because the injury is so insidious its extent was not known until Mr. D. L. Van Dine demonstrated the "Damage to Sugar Cane Juice by the Moth Stalk-Borer (*Diatraea saccharalis* Fabr.)" in the very first circular to be issued by the Experiment Station of the Porto Rico Sugar Producers' Association (pp. 11, Río Piedras, 1912). Indeed, Mr. Van Dine gave first place to this pest in his lists of the insects of sugar-cane (1913-28) and (1913-251), even tho white grubs actually caused more serious and certainly more obvious injuries at that time, before the introduction of the giant toad. Mr. Thos. H. Jones prepared the first extended account (Bulletin No. 12, Experiment Station, Board of Commissioners of Agri-



Shoot of sugar-cane on which is resting (1) an adult female of *Diatraea saccharalis* (F.), which has laid a cluster of eggs (2). The egg-cluster (3) has been eaten by ants, (4) is partly parasitized: black, and partly hatched: white. Under the lens, greatly enlarged, is a fresh egg-cluster of the moth-borer being parasitized by *Trichogramma minutum* Riley (5), and by *Prophanurus alecto* Crawford (6). (Drawn by G. N. Wolcott.)

culture, pp. 1–30, fig. 8. Río Piedras, March 16, 1915), and Dr. John R. Johnston (1915-24) the first record of the larva being attacked by the entomogenous fungus, *Cordyceps barberi*, or *Isaria* (*Cordyceps*) *barberi*

Giard, as it was later listed by Mr. J. A. Stevenson (1918-218) and by Miss Vera K. Charles (1941-734). A more intensive study showed the "Influence of Rainfall and Burning the Trash on the Abundance of *Diatraea saccharalis*" (Circular No. 7, Insular Experiment Station, pp. 1–5, map. Río Piedras, 1915) and "The Influence of the Variety of Sugar Cane on its Infestation by *Diatraea saccharalis* Fabr., and the Other Factors Affecting the Abundance of the Moth Borer" (Jour. Dept. Agr. P. R., **6** (1):21–31, fig. 2. San Juan, October 1922), both stressing the importance of the egg-parasite, *Trichogramma minutum* Riley, and the minor role played by the other egg-parasite, *Prophanurus alecto* Crawford. It was found, also, that the lizards *Anolis pulchellus*, *Anolis krugii*, *Anolis stratulus* and *Anolis cristatellus* eat a surprisingly large number of the caterpillars. The effect of "Weather and the Non-burning of Trash in Borer Control in Porto Rico" was presented at the Fourth International Congress of Entomology at Ithaca, New York, August 1928 (**2:** 62–64, ref. 1), in an attempt to summarize what was known at that time of the ecology of this insect.

Mr. Harold E. Box, an English entomologist coming to Puerto Rico from British Guiana, first intensively studied the larval parasites, as his "Report upon a Trip to Porto Rico April–July 1924" (pp. 22. S. Davison & Co., Ltd., Berbice, B. G., November 1924), later expanded to "Observations on *Lixophaga diatraeae* Townsend, a Tachinid Parasite of *Diatraea saccharalis* Fabr., in Porto Rico" (Bull. Ent. Research, **19** (1): 1–6, ref. 11, fig. 1. London, August 1928), and "The Introduction of Braconid Parasites of *Diatraea saccharalis* Fabr., into Certain of the West Indian Islands" (Bull. Ent. Research, **18** (4): 365–370, fig. 2, pl. 1. London, May 1928), shows. He discussed the systematic position of the local economic species in "The Crambine Genera *Diatraea* and *Xanthopherene* (Lep., Pyral.)" (Bull. Ent. Research, **22** (1): 1–50, fig. 5, pl. 5. London, March 1931), and in "The Food Plants of the American *Diatraea* Species" (pp. 11, Port-of-Spain, Trinidad, 1935) listed *Hymenachne amplexicaulis*, *Oryza sativa*, *Panicum barbinode*, *Panicum maximum*, *Pennisetum purpureum*, *Saccharum officinarum* and *Zea mays*. Altho no longer directly connected with Puerto Rico, Mr. Box has continued his investigations on the borer in some of the Lesser Antilles, and most recently in Venezuela.

The book by Mr. F. S. Earle, "Sugar Cane and its Culture" (pp. 355, fig. 24. John Wiley & Sons, New York, 1928) contains a chapter (pp. 162–188, ref. 22) on the "Insect and other Pests of Sugar Cane" giving a practical account of the borer, with recommendations for control that can be adopted by field men. Mr. D. W. May, Director of the Mayagüez Station, in his directions for "Germinating Sugar-Cane" (Agr. Notes No. 38, pp. 2. San Juan, April 1927), notes that soaking in lime water for one day, water alone, or with lime and magnesium, stimulated germination and killed the borer caterpillars. At the Fourth Congress of the International

Society of Sugar Cane Technologists, held at San Juan, March 1 to 16, 1932, some of the field men anticipated that the presence of so many entomologists would result in definite, specific and practical methods of control being formulated. No entomologist was that sanguine, and the discussion of the comparative merits of egg-parasites vs. larval parasites was inconclusive. Dr. M. D. Leonard and Mr. Francisco Seín presented their "Observations on Some Factors which may Affect the Abundance of *Diatraea saccharalis*" (Bull. No. 92, pp. 2), while the paper "On Methods of Determining Borer Abundance in Cane Fields" (Bull. No. 88, pp. 2) was ignored. Eventually, however, "The Introduction of Parasites of the Sugar-Cane Borer into Puerto Rico" (Jour. Agr. Univ. P. R., **21** (2): 237–241. Rio Piedras, July 1937) became the major activity of Mr. S. M. Dohanian in Demerara and Perú. Later reports from the Mayagüez Station (1938-96) indicated that none of the parasites he collected became established, while a native parasite of the larva, *Lixophaga diatraeae* TT reached a high of 31.9% at Hormigueros, and *Bassus stigmaterus* Cresson a high of 4.8% at the same locality in 1936. Dr. K. A. Bartlett renewed the attempts at introducing the "Amazon Fly" (*Metagonistylum minense* TT) into Puerto Rico, making collections from regions in southern Brasil with climatic conditions more nearly similar to those the flies would find here, as is told by him in the "Biological Control of the Sugar-Cane Moth Borer in Puerto Rico" (P. R. Sugar Manual, pp. 7–9. New Orleans, 1938) and "The Collection of Parasites of the Sugar-Cane Borer, *Diatraea saccharalis*, in São Paulo, Brazil" (Sixth Pacific Science Congress, July 1939).

"The Extent to which the Practice of Not Burning Cane Trash has been adopted in Puerto Rico" (Jour. Dept. Agr. P. R., **17** (3): 197–8. San Juan, July 1933) was 84.7% of all fields observed in a trip around the Island made April 3 to 5, 1933. The trend towards decreased infestation due to the non-burning of trash is balanced in recent years by increased infestation due to planting of superior varieties with low fiber content, making them more susceptible to attack. The importance of having exact data on the extent of "Natural Parasitism by *Trichogramma minutum* of the Eggs of the Sugar-Cane Moth Borer, *Diatraea saccharalis*, in the Cane Fields of Puerto Rico" (Jour. Agr. Univ., P. R., **27** (2): 39–83, fig. 1, pl. 6, ref. 14. Río Piedras, June 1944) was fundamental in undertaking experiments in "Control of the Sugar-Cane Borer in Puerto Rico by Laboratory-Reared Parasites" (Jour. Ec. Ent., **36** (3): 460–464. Menasha, June 1943). This was a five year project, taking practically all of the time of Dr. Luis F. Martorell for his part of the field work during that period. As summarized in "Criteria for *Trichogramma*" (Tropical Agriculture, **20** (11): 221–2, ref. 3. St. Augustine, Trinidad, November 1943), conditions

are optimum in Puerto Rico for maximum parasitism during June, July and August, but beginning in September or October and reaching a peak in mid-winter, some fields of gran cultura cane show a deficiency and often a complete absence of *Trichogramma*: a condition which may be promptly changed by the release of laboratory-reared wasps. It is hardly to be expected that this will be surely and decisively reflected a year later, when the cane is harvested, in an obvious reduction in borer injury to the mature stalks, for the tendency of *Trichogramma* is for dispersion, invading check fields as well as high cane, and making impossible an exact statistical proof of the benefits of releases.

Nevertheless, such releases seem to promise more continuing benefits that ground or airplane dusting or spraying with cryolite and various other insecticides tested on a field scale elsewhere, but merely being considered in Puerto Rico. The most promising method of control, a purely incidental benefit among the engineering considerations, is that which may result from overhead irrigation. If the artificial application of water in this way proves to be the equivalent of rainfall, it may partially solve the problem of borer control in areas where it is economically and mechanically possible. To give some indication of the possible value of the newer insecticides, a dozen of them have been applied by overhead irrigation at two week intervals, September–November 1950, in circular areas of two and a half acres at Hda. Santi, Central Cortada.

Diatraea saccharalis is not only a major pest of sugar-cane, but, as shown by Dr. Richard T. Cotton (1918-290), the caterpillars may cause considerable damage to corn. It is not severe, however, because corn is harvested within a few months, and also the caterpillars are more subject to attack by parasites. Elephant grass and other large forage grasses are also sometimes infested, but the most obvious injury is to rice. The stems of rice are so small that the fully-grown caterpillar finds them a tight fit even when it has hollowed them out completely, and just as the crop is approaching maturity many of the weakened stems may droop or fall over, effectually preventing the harvesting of the crop. This is of little importance when rice is merely an experimental crop, but might prevent it from being widely grown commercially in Puerto Rico.

Subfamily Schoenobiinae

Rupela longicornis was described as a *Scirpophaga* by Herr Heinrich B. Möschler (1890-321) from a pair collected in Puerto Rico by Dr. Gundlach, and listed by him. These are large, silvery white moths, with conspicuous tufts of radiating scales on collar and patagia of male; "abdomen long, in female expanding at extremity and with very large anal tuft" of golden scales, of which Mr. E. G. Smyth collected eighty-seven at light at Hda.

Santa Rita, Guánica: seven in July and eighty in October of 1913. In August 1939, Dr. Luis F. Martorell found them on Mona Island, and they have been intercepted at light at Mayagüez and Bayamón. Dr. Schaus (1940-403) records collections at Arecibo, Dorado, Cataño and Río Piedras. The Cornell University collection has specimens from Desengaño (Cartagena Lagoon) and Toa Baja. Both Dr. Gundlach and Herr Möschler also give the name *Scirpophaga leucatea* Zeller, and Dr. Harrison G. Dyar's determination of the Guánica specimens was *Rupela albinella* Cramer, entered in Van Zwaluwenburg's list as P. R. 1410.

Subfamily Epipaschiinae

Pococera atramentalis (Lederer) is listed from Puerto Rico by Herr Möschler and Dr. Gundlach under the name *Phidotricha erigens* Ragonot. It is 1226 on mango and 1626 on *Clerodendron squamatum* in Van Zwaluwenburg's list, and has repeatedly been intercepted at light at Bayamón. Mr. A. S. Mills reared it from the buds of "flamboyán" (*Delonix regia*) and from "almendro" (*Terminalia catappa*). Dr. Schaus (1940-403) records collections from San Germán, Cataño and El Yunque, and from Vieques Island.

Pococera insularella (Ragonot) was listed by Dr. Gundlach and Herr Möschler as a *Tetralopha* from Puerto Rico: a single female collected by the former. Dr. Schaus (1940-404) records collection at San Germán, the larvae from others of the West Indies and in Central America observed feeding on "bulbs of Henequen and Sisal."

Tetralopha scabridella Ragonot was listed from Puerto Rico by Herr Möschler and Dr. Gundlach. In "Insectae Portoricensis" (1923-195) the habits are recorded of the "brown larvae, with lighter-colored medio-dorsal stripe bordered with black, (which) web together several terminal leaves of *Inga vera*, making "nidos de mariposa," at Lares, as determined by Dr. Wm. Schaus, at Cayey, and generally common on host thruout the coffee districts." Dr. Schaus (1940–404) records collection at Villa Margarita, by Prof. Forbes, and Dr. Luis F. Martorell's observation on El Yunque refers to occurrence on the coffee shade trees remaining at Hda. Santa Catalina, where the old road ended and the trail began.

Jocara majuscula (Herrich-Schäffer) was re-described by Herr Heinrich B. Möschler (1890-279) under the name *Deuterollyta infectalis*, and it is thus listed by Dr. Gundlach who collected the type material in Puerto Rico. Dr. Schaus (1930-404) records collection at Adjuntas.

Jocara ragonoti was described by Herr Heinrich B. Möschler (1890-280) as a *Deuterollyta* from a pair collected by Dr. Gundlach in Puerto Rico, and listed by him. Dr. Schaus (1940-405) reports "no specimens," but this should be the common leaf-webber of "mangle de botón" (*Conocarpus*

erecta), repeatedly observed on this host at many points along the coast around the Island, and also noted on Mona Island, identified by Mr. Carl Heinrich as "sp., not in the Museum collection." It is a common, but hardly a serious pest.

Stericta alnotha was described by Dr. Wm. Schaus (Proc. Ent. Soc., Washington, **24**(9): 239. Washington, D. C., December 1922), the type from Puerto Rico.

Subfamily Phycitinae

As the subfamily Phycitinae was omitted from treatment by Dr. Schaus in his "Moths of the Families Geometridae and Pyralididae" (Scientific Survey of Porto Rico and the Virgin Islands, **12** (3): 291–417, see page 329), no systematic arrangement was available for the species present in Puerto Rico, some of which are of considerable economic importance. Of these, the "Mahogany Moth" of the foresters of Trinidad, or the "cedro shoot-borer" as it might more properly be called, **Hypsipyla grandella** (Zeller), is largely responsible for the failure of Spanish cedar or "cedro" (*Cedrela odorata* or *Cedrela mexicana*) in Puerto Rico. The mass attack of its specific leafhopper, causing defoliation long before the leaves would normally fall, might be survived, but the caterpillar of *Hypsipyla* attacks the main shoot of young seedlings in the nurseries, or shortly after they have been transplanted to their permanent location, burrowing into it and causing it to wither and eventually to die. The volunteer new shoots sent out are in turn attacked so that the resulting tree is so gnarled and crooked as to be of little or no economic value, even if it does succeed in attaining marketable maturity. And, as noted by Mr. José Marrero in "Forest Planting in the Caribbean National Forest" (Caribbean Forester, **9** (2): 85–213, fig. 7, ref. 14. Río Piedras, April 1948), "its attacks became more evident in unthrifty stands," so that "large-scale plantings of cedar have been discontinued pending results of investigations." The first record for Puerto Rico is of determination of adults by Mr. Carl Heinrich for Dr. M. D. Leonard (1932-128), whose attention was called by Mr. Wm. R. Barbour to the abundance of the caterpillars "having done considerable damage to about 4,000 young trees at Jayuya and to about 1,000 young trees recently planted at Adjuntas in June 1931; a number of young trees were moderately infested at Lares," but unfortunately he gives an incorrect scientific name for the host and misspells the name of the moth. The adult looks somewhat like a Noctuid, with its dull brown color extending even to the costal margin of the hind wings. The caterpillars are parasitized by an Ichneumonid wasp, identified by Mr. R. A. Cushman as a species of *Calliephialtes*, but these have been reared but once, by Dr. Luis F. Martorell at Cayey in May 1940. That the insect was not known previously may

indicate that it is not endemic, but was accidentally introduced in planting material, or, as it attacks only young shoots on which individual eggs are laid, that although present in small numbers previously, it had no opportunity to become noticeable on the few old native cedros remaining in Puerto Rico.

Hypsipyla muriscus Dyar, as re-determined by Mr. Carl Heinrich, was reared from larvae intercepted at Mayagüez completely destroying the seed of "mamey" (*Mammea americana*).

Acrobasis crassisquamella Hampson, as identified by Mr. Carl Heinrich, has been repeatedly intercepted at light at Bayamón. Dr. J. A. Bonnet found the leaves of an ornamental tree (*Acassia nodosa*) with pink flowers being eaten by these caterpillars at Río Piedras in February 1944. The moths are small and inconspicuous, grey-brown in color.

Homalopalpia dalera Dyar, as identified by Mr. Carl Heinrich, has been repeatedly intercepted at light at Bayamón.

Myelois ceratoniae Zeller, as identified by Mr. Hahn W. Capps, was intercepted as larvae in the pods of tamarind (*Tamarindus indica*) at San Juan and at Arecibo.

Myelois decolor Zeller, as identified by Mr. Carl Heinrich was intercepted as larvae in pods of "algarrobo" (*Hymenaea courbaril*) at Arecibo.

Myelois furvidorsella Ragonot was re-described by Herr Heinrich B. Möschler (1890-326) from two females which Dr. Gundlach had collected in Puerto Rico, and listed (1891-370), without indication of the host of the larva.

Ephestia cautella (Walker), as identified by Mr. Carl Heinrich, was intercepted as larvae at Bayamón feeding on fruits of "icaco" (*Chrysobalanus icaco*), and at Dorado feeding on fruits of "almendra" (*Terminalia catappa*). Mr. L. Courtney Fife (1939-6) found it attacking injured cotton seed.

Crocidomera fissuralis (Walker), originally described from Santo Domingo, is re-described by Herr Heinrich B. Möschler (1890-327) from a single male which Dr. Gundlach collected in Puerto Rico.

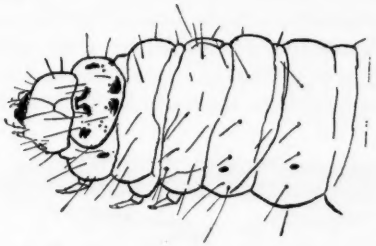
Crodidomera turbidella Zeller is listed from Puerto Rico by Herr Möschler and Dr. Gundlach, and was subsequently identified from unlabeled specimens by Dr. Schaus.

Plodia interpunctella (Hübner), the Indian meal moth, has been found only once in Puerto Rico: by Mr. J. D. More at Río Piedras in April 1921, the larvae feeding on dry dates, and present in great abundance. His identification was confirmed by Dr. Richard T. Cotton, who, in his "Insect Pests of stored grain and grain products," on page 28, writes: "It is handsomely marked and can be distinguished from other grain infesting moths by the characteristic markings of its fore wings. These are reddish brown with a coppery luster on the outer two-thirds, but whitish gray on the

inner or body end." It is doubtful if this pest is a permanent resident in Puerto Rico, but new records may be anticipated if brought in with infested food products.

Cuba furculella Dyar, as identified by Dr. Wm. Schaus, was collected at light by Dr. W. A. Hoffman at El Semil, Villalba, and had previously been determined by Dr. Schaus from unlabeled specimens from Puerto Rico.

Etiella zinckenella (Treitschke), the lima-bean pod borer, was listed from Puerto Rico by Herr Möschler and Dr. Gundlach, the latter having a single female. Dr. M. D. Leonard and Mr. A. S. Mills prepared "A Preliminary Report on the Lima Bean Pod-Borer and other Legume Pod-Borers in Porto Rico" (Jour. Ec. Ent., **24** (2): 466–473). Geneva, April 1931) in which they note the presence of larvae in lima beans, pigeon peas, crotalaria and cowpeas; that cocoons are formed in the ground, the pupal



Forepart of larva of *Etiella zinckenella* (Treitschke), ten times natural size. (Drawn by G. N. Wolcott.)

period being less than two weeks and that the caterpillars are parasitized bv *Heterospilus etiellae* Rohwer and an *Eurytoma* near *insularis* Ashmead. Messrs. Richard Faxon and C. P. Trotter (1932-445) record the abundance of these caterpillars in bean pods, and Dr. Leonard (1932-122, 1932-131 and 1933-102 and 122) gives specific locality records in various hosts and on Vieques Island. Indeed, up to 1936, the larvae had been intercepted twenty-seven times in pigeon peas: at Río Piedras, Cataño, Isabela, Aguadilla, Mayagüez, Utuado, San Antonio, Ponce, Peñuelas, Ensenada, Lajas and Arroyo, and repeatedly intercepted in lima bean pods at Bayamón, Isabela and Yauco, and found in pods of *Crotalaria incana* at Isabela and at Mameyes. The first season's continuous observations showed them to be common in lima bean pods at Isabela during the summer, but practically disappearing in the winter when commercial shipments would normally be made to the continental market. Later observations showed little seasonal variation in abundance in the original wild host, *Crotalaria incana* L., and in "Lima Bean Pod-Borer Caterpillars of Puerto Rico on their Wild Hosts" (Jour. Agr. P. R., **18** (3): 429–434, ref. 2. San

Juan, October 1934), they were noted as much more abundant in hairy crotalaria pods of plants growing on sandy beaches than in those growing on heavy clay soil. The eggs are laid between the hairs on the pods, sometimes as many as eight eggs being found on a pod, but one never finds more than one caterpillar inside the pod subsequently. The egg may be, but is not often parasitized by *Trichogramma minutum* Riley. The caterpillar has a yellowish or brownish head, and its body, normally green, may become purplish at maturity. It is readily distinguishable, however, by the thoracic shield, which "is invariably opalescent greenish-yellow, marked with a very definite pattern in black." The fore wings of the adult costally are broadly margined "with silvery white, these margins blending with the white of the legs and abdomen when the moth is at rest. Its large palpi stick out like a beak in front." As noted in the reports of the Mayagüez Station, Mr. H. K. Plank (1937-74) found these caterpillars feeding in the pods of *Tephrosia toxicaria*, with the heaviest infestation (1938-71) during the summer, and (1939-108) parasitized by *Heterospilus etiellae* Rohwer and *Agrophylax* sp. nov. at Isabela. One additional host record is of interception of larvae in pods of *Martiusia laurifolia* at Dorado.

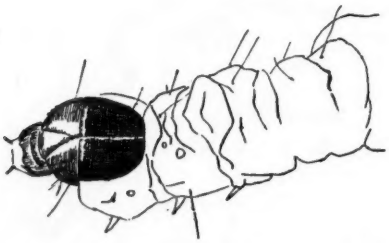
Adult of the Lima Bean Pod Borer, *Etiella zinckenella* (Treitschke), five times natural size. (Drawn by G. N. Wolcott.)

Fundella pellucens Zeller, the Caribbean pod borer, was listed by Herr Möschler from Puerto Rico, where Dr. Gundlach had collected a pair. The material collected by Mr. Thos. H. Jones (1915-8) was most unfortunately mis-identified, so that the name *Pachyzancla bipunctalis* F. was used by him in recording the attack of its larvae on garden beans and the pods of sword beans, *Canavalli ensiformis*. Dr. Richard T. Cotton (1918-292 listed it as *Ballovia cistipennis* Dyar: the stalk and pod borer of cowpeas, originally described from Barbados, and since found in St. Vincent, St. Croix and at Port-au-Prince, Haiti. By Dr. M. D. Leonard and Mr. A. S. Mills (1931-471) and subsequent economic workers it was called *Fundella cistipennis* Dyar, and only recently has its synonymy been shown with what Dr. Gundlach collected here. Mr. Arturo Riollano (1931-113) noted its presence on Vieques Island, and Dr. Leonard (1931-119 and 1932-122, 131 and 135) in cowpeas, pigeon peas, black-eyed peas, lima beans and sword beans from various localities in Puerto Rico. Its real economic importance is as a pest of lima beans during the winter shipping season. Spraying

Injury to pods of Sword Bean, *Canavali ensiformis*, caused by caterpillars of the Caribbean Pod Borer, *Fundella pellucens* Zeller. (Drawn by G. N. Wolcott.)

with Bordeaux, arsenicals, rotenone and pyrethrum is ineffective in preventing oviposition or hatching of the eggs, or in killing the small caterpillars before they burrow into the pods, and indeed seems to cause them to seek safety inside the pods earlier than if they were unsprayed. Even

the fully-grown caterpillar makes no exit-hole until it is ready to leave for pupation in the ground, but sorters soon learn to spot and eliminate the infested pods in packing for shipment. Control is the more difficult because "its original wild hosts are the beach bean, *Canavali maritima*, and "hedionda" (*Ditremexa* or *Cassia occidentalis*)," the latter being a common weed of field margins. The record in "Insectae Borinquenses" (1936-478) of "larvae boring in shoots of Uba cane at Villalba" is a printer's error: it should have been under *Elasmopalpus lignosellus* Zeller, on the same page, while that of larvae boring in stalks and stems of cowpeas (under *Elasmo-*



Forepart of larva of *Fundella pellucens* Zeller, ten times natural size. (Drawn by G. N. Wolcott.)

Adult of the Caribbean Pod Borer, *Fundella pellucens* Zeller, five times natural size. (Drawn by G. N. Wolcott.)

palpus rubedinellus Zeller) was the observation of Dr. Richard T. Cotton on *Fundella pellucens*. "The thoracic shield of *Fundella* (larvae) is of the same color as the head, or possibly a little darker, unmarked, or with the markings scarcely visible because of the dark color of the entire shield, or with the markings distinct but vaguely outlined and of a variable pattern. The moth is of a characterless, inconspicuous greyish-brown, with no marked or well-defined pattern on the wings, but with the interesting habit of often keeping the ends of its antennae underneath its folded wings."

Mr. L. B. Scott found that all three of "The Bean Pod Borers in Puerto Rico" (Jour. Agr. Univ. P. R., **24** (2): 35–47, fig. 2, ref. 3. Río Piedras, August 1940) could be controlled with cryolite, and that the small-seeded lima bean, variety Carolina, is highly resistant to their attack.

Elasmopalpus lignosellus (Zeller) was listed by Herr Möschler and Dr. Gundlach from Puerto Rico, the latter having collected several specimens there. This is the lesser cornstalk borer of the southern United States, first noted attacking shoots of Uba cane at Villalba during the summer of 1924 by Mr. Francisco Seín, as reported by Dr. H. L. Dozier (1926-117), but since repeatedly found in fields of young ratoons in which the trash had been burned. The tunnels are smaller than those made by *Diatraea* caterpillars, and cleaner, for the *Elasmopalpus* leave no excrement in their tunnels but live outside in a crack or under debris in a silken tunnel rendered more opaque and less obvious by the drying excrement entangled in its strands. Control in fields of sugar-cane is obtained by not burning trash, for the injury has never been found in fields where the trash remained from the previous crop. At the Mayagüez Station (1937-43), these caterpillars were found attacking dry-bean variety tests on Las Mesas; (1938-57) killing 90 per cent of lima bean plants, also peas and cowpeas, and subsequently (1940-49) attacking teosinte. Their most spectacular attack, however, was at Cerro Gordo on a planting, several acres in extent, of seedlings of "guanábana" (*Annona muricata*) during the late summer of 1945. Of the comparatively few seedlings which survived damping-off, changas and other difficulties, the stem was entered an inch or less below the surface of the ground; the caterpillar boring up and down and leaving little more than a shell of the plump stem of the seedling. The seeds of guanábana had been planted in unshaded, naked beds of sandy soil, with no protecting mulch or trash, and presented a most desirable target for attack by these caterpillars. Living as they do outside of their tunnels, they are mostly dark in color, with a very dark spot dorsally on each segment. The adult is a little grey moth, the central and basal portion of the fore wings being a lighter grey; the hind wings very light and semi-transparent.

Elasmopalpus rubedinellus (Zeller) was listed from Puerto Rico by Herr Möschler and Dr. Gundlach, the latter having collected three specimens. This is a somewhat reddish-brown little moth, of which Mr. Thos. H. Jones found thousands flying over just-plowed land at Maunabo in June 1912, the adults being determined by Dr. Schaus.

According to Mr. Carl Heinrich, neither *Piesmopoda columnella*, nor *P. rubicundella*, described by Zeller from Colombia, but listed by Herr Möschler and Dr. Gundlach, actually occur in Puerto Rico.

Piesmopoda rufulella Ragonot was re-described by Herr Möschler (1890-328) from a pair which Dr. Gundlach had collected and listed from Puerto Rico. It is an insignificant little moth, repeatedly intercepted at light at Bayamón and Comerio, and taken by Dr. W. A. Hoffman at light at El Semil, Villalba in May 1940.

Oligrochroa pellucidella Ragonot was re-described by Herr Möschler

(1890-329) from two specimens which Dr. Gundlach had collected in Puerto Rico, and listed from there. It has not since been found locally.

Oncolabis anticella Zeller was identified by Herr Möschler from a pair which Dr. Gundlach had collected in Puerto Rico.

Nonja exiguella Ragonot is re-described as an *Homoeosoma* by Herr Möschler (1890-330) from a pair which Dr. Gundlach had collected in Puerto Rico.

Homoeosoma maturella Zeller was listed from Puerto Rico by Herr Möschler: a single male collected by Dr. Gundlach and listed by him.

Salebria famula (Zeller) was identified by Herr Möschler from a single female which Dr. Gundlach had collected in Puerto Rico. Mr. Heinrich doubts the correctness of this and the preceeding identification.

Laetilia portoricensis was described by Dr. Harrison G. Dyar, the type from Puerto Rico (Insecutor Inscitiae Menstruus, **3:** 62. Washington, D. C., 1915) collected by Mr. Thos. H. Jones, the larvae feeding on scale insects on pigeon peas at Mameyes, November 1913. Presumably this is their normal habit, as they have since been intercepted feeding on *Saissetia oleae* on African tulip tree or "tulipán" (*Spathodea campanulata*), but Mr. E. G. Smyth reared two of these "small drab moths," as identified by Dr. Wm. Schaus, from withering stems of "Santa María" (*Eupatorium* or *Osmia odorata*), in the summer of 1916. Adults have been intercepted at light at Bayamón. They are little brownish moths, the costal margin of the fore wing a light grey.

Hyblaeidae

Hyblaea puera (Cramer) was listed from Puerto Rico by all the early entomologists, Herr Möschler (1890-183) noting "Raupe auf Crescentia, Tecoma pentaphylla," and in Van Zwaluwenburg's list it is P. R. 124. This is an East Indian and Oriental insect, a serious pest of teak (*Tectona grandis*) there and also attacking *Bignonia* and *Millingtonia*, yet in Puerto Rico it has been observed on none of these hosts. Locally it has been noted repeatedly with the larvae feeding on the leaves of "roble" (*Tabebuia pallida* or *Tecoma pentaphylla*), and on the leaves of the African tulip tree or "tulipán" (*Spathodea campanulata*). Dr. Luis F. Martorell (1939-25) records an extensive outbreak in nurseries at Cayey of "capá blanco" (*Petitia domingensis*) so serious that it was controlled only by spraying with arsenate of lead. The caterpillars feed only at night, during the daytime remaining hidden in the shelter of a folded-over leaf, or, as they become larger, of several leaves held together. Pupation may occur in this shelter, or in leaves on the ground, or in the soil. The adult is a stout-bodied moth showing considerable variation in its markings. The fore wings may be entirely velvety brown, or barred, or with a distinct pattern

of light grey or darker brown; the hind wings with three orange-red or yellow spots on brown, and margined with the orange-red or yellow; the same color being repeated in a narrow transverse band on each abdominal segment.

Thyrididae

Rhodoneura myrsusalis (Walker) was listed from Puerto Rico by Herr Möschler as *Striglina scallula* Guenée, of which he describes a variety *immaculata* (1890-123) "lacking the transparent patch on the fore wing," and both of these were listed by Dr. Gundlach. Prof. Forbes (1930-74) notes this moth as being "general in tropics of both hemispheres," but no recent collection has been made locally, except for a very small specimen from Lares, taken by Mr. Francisco Seín.

Pterophoridae

Pterophorus basalis was described as an *Oedematophorus* by Herr Hein rich B. Möschler (1890-345) and listed by Dr. Gundlach: a single specimen in the Berlin Museum. Prof. Forbes (1931-345) doubtfully identified from Lares "a very poor specimen, but much too large for any other species known to the region."

Pterophorus inquinatus (Zeller), a "mottled gray (moth), with an oblique series of darker shades across middle of (fore) wing; larva on *Ambrosia*"; is listed by Prof. Forbes (1931-345) from Coamo.

Pterophorus paleaceus (Zeller) is listed from Puerto Rico by Herr Möschler and Dr. Gundlach: a single specimen in the Berlin Museum. It has not since been found locally, but Prof. Forbes (1930-77) records from material from the eastern United States "larva varying from greenish white to dull salmon, the shorter hairs sticky, on *Vernonia*."

From leaves of sweet potato, Mr. E. G. Smyth during the summer of 1916 at Río Piedras reared some small brownish moths which Mr. Aug. Busck determined as a species of *Pterophorus*.

Adaina bipunctata was described as *Pterophorus* by Herr Heinrich B. Möschler (1890-346) as "sehr klein," from a single specimen collected in Puerto Rico by Dr. Gundlach and listed by him. Mr. A. S. Mills intercepted larvae on "salvia" (*Pluchea purpurascens*) and adults have been intercepted at light at Bayamón, and collected by Dr. W. A. Hoffman at El Semil, Villalba, at Dorado and in Santurce. Prof. Forbes (1931-345) records additional collections from El Yunque, Aguirre and Coamo, and from Vieques Island.

Adaina praeusta was described as a *Pterophorus* by Herr Heinrich B. Möschler (1890-346) from a single specimen collected in Puerto Rico by Dr. Gundlach, and listed by him. It has been intercepted at light at San

Juan and Bayamón. Prof. Forbes (1930-75) is of the opinion that it "may be a form of the preceding, rubbed specimens of which tend to lose the costo-apical spot."

Adaina participata was described as a *Pterophorus* by Herr Heinrich B. Möschler (1890-346) from a single specimen collected in Puerto Rico by Dr. Gundlach, and listed by him. Prof. Forbes (1931-345) records more recent collections at Lares, Coamo and from Vieques Island.

Marasmarcha pumilio (Zeller), a "light brown (moth) with two or three black spots; 15 mm.," has been collected at Naranjito, according to Prof. Forbes (1930–78). He also collected it on Vieques Island, and has specimens from Cataño, Coamo and San Germán.

Trichoptilus defectalis (Walker), as identified by Prof. Forbes (1930-78), has been collected at Coamo, Guayanilla, and Ensenada, and Prof. J. A. Ramos (1947-51) found it on Mona Island. The moth is "light ochreous brown, with faint paler transverse bars; tufts of black scales and some white ones in the fringes; hind wings dark brown, a single larger tuft in the third feather; 14 mm. Larva with large clubbed primary hair and a few secondaries; yellow, with reddish stripes; on *Boerhaavea* and *Amaranthus.*"

Subsequent collections have been made on Vieques Island, and at Palmas Abajo, Aguirre and Coamo.

Sphenarches caffer (Zeller), the Lab-Lab Plume moth, was first reported from Puerto Rico by Prof. Forbes (1930-79), identifying adults intercepted as larvae by Messrs. C. P. Trotter and Herschell Fox on pigeon peas at San Juan, and others previously identified by Mr. Aug. Busck as a species of *Oxyptilus* for Mr. Thos. H. Jones, who had reared them from larvae and pupae on *Caperonia regalis* at Río Piedras in August 1912. From one pupa Mr. Jones thought a parasite had emerged, and another showed indication of attack by a fungus, which was not identified. Prof. Forbes describes this plume moth as being "light ochre, first feather of fore wing dark with pale bars. Fringes with numerous scattered black spatulate scales, which are most numerous in the dorsal fringes, where they tend to gather into tufts. Larva with both clubbed and long simple hairs; pupa spinose, exposed."

Platyptilia crenulata Barnes & McDunnough, originally described from the southern United States, was identified by Prof. Forbes (1931-346) from Puerto Rico: a rubbed specimen from Coamo, "reddish brown, with white subterminal line across both lobes of fore wing, a triangular blackish shade before subterminal line in the first lobe, and another before the notch."

Platyptilia pusillidactyla (Walker) was reared by Mr. E. G. Smyth during the summer of 1916 at Río Piedras on "sacatrapos" (*Caperonia palustris*), the adults being determined by Mr. Aug. Busck. They are described by Prof. Forbes (1930-80) as being "smoky with a pale and dark

band across each feather of the fore wing near its apex. Caterpillar pale yellow, without obvious structures or markings," and (1931-346) collected at Coamo.

Ochyrotica fasciata Walsingham, as identified by Mr. Aug. Busck, has been intercepted on guava leaf at Barceloneta.

Orneodidae

Orneodes eudactyla (Felder) was listed as an *Alucita* from Puerto Rico by Herr Möschler and Dr. Gundlach, and Prof. Forbes (1930-80) records his collection of this species at Coamo.

Tortricidae

Apinoglossa comburana was described by Herr Heinrich B. Möschler (1890-331) from a pair collected in Puerto Rico by Dr. Gundlach and listed by him. It has not since been found anywhere. Prof. Forbes (1930-83) condenses Möschler's description to "fore wing with costal fold in male. Tawny, shaded with yellow-brown, especially on inner margin and before outer margin. Hind wing with inner half shaded with gray. 12 mm."

Paratorna rotundipennis (Walsingham), as determined by Prof. Wm. T. M. Forbes, was reared from numerous larvae, tying together the leaves and almost defoliating a small tree of Hawaiian algarroba or "bayahonda" (*Prosopia juliflora*) at Boquerón during the autumn of 1923. He describes (1930-83) the adults as being "tawny reddish, with waterlines and faint darker shades."

Coelostathma parallelana Walsingham is identified by Prof. Forbes (1931-346) from Lares and El Yunque, and (1930-84) Naguabo, described as "cream-colored, with two transverse fawn bands. 12 mm." It has also been intercepted at Bayamón and San Juan.

Drachmobola insignitana was described as a *Tortrix* by Herr Heinrich B. Möschler (1890-330) from a single female collected in Puerto Rico by Dr. Gundlach, and listed by him. Prof. Forbes (1930-84) summarized Möschler's description of the adult as being "pale yellow with darker strigulations on fore wing, and black discal dot. 10 mm.," and notes collections at Aibonito, but (1931-346) with additional material from El Yunque, and what Dr. W. A. Hoffman found at Jájome Alto, notes that "females are considerably darker than implied by Möschler's description, but fit well enough. The male is strikingly different," and gives an extended description.

Sparganothis effoetana was described as a *Tortrix* by Herr Heinrich B. Möschler (1890-330), from single female collected in Puerto Rico by Dr. Gundlach and listed by him. It has not since been collected anywhere.

Prof. Forbes (1930-85) re-describes the adult as having "fore wing powdery rusty brown; terminal line of hind wing also tawny. 18 mm."

Sparganothis flavedana (Clemens), originally described as a *Platynota*, has "palpi long and beak-like, fore wing heavily tufted. Red-brown, the basal three-fourths of the fore wing darker brown, and typically contrasting in male," according to Prof. Forbes (1930-85). He continues "female much larger than male; 10–20 mm.," and records collection from Coamo. On the accession card (880-16) recording the rearing of the adult by Mr. E. G. Smyth during the summer of 1916 from a larva on "jobo" (*Spondias mombin*), Prof. Forbes wrote *Sparganothis* (group *Platynota*). Mr. Smyth considered this identical with another moth which he had reared at the same time from the hairy form of *Malachra rotundifolia*, which he had identified as a species of *Archips*. Prof. Forbes (1930-83) records these as "perhaps *A. jamaicensis* Walker"—a record which cannot stand if his determination of Smyth's material is correct. He notes that the larva of *Sparganothis flavedana* is a general feeder, and Dr. Luis F. Martorell has had adults reared from greenish larvae on "cedro" (*Cedrela odorata*) in April 1941 thus identified. Mr. J. F. Gates Clarke determined as a species of *Platynota* some that Dr. Martorell in June 1940 had reared from larvae feeding on the leaves of "guayacán" (*Guaiacum officinale*) at Salinas. This is the determination of adults reared from larvae intercepted on icaco fruits, from rose, and from "molinillo" at Pueblo Viejo. At the Mayagüez Station (1939-120) it is recorded as a minor pest of vanilla. These records may, or may not, all refer to the same insect.

Mr. Robert Lambert, a graduate student at Cornell University specializing in this group, finds only two specimens from Puerto Rico: one each from Coamo and Lares, and these he considers to be *rostrana*.

Sparganothis saturatana (Walker) is listed by Prof. Forbes (1931-347) from Coamo, having the "fore wing fawn, with brown reticulation and transverse lines toward outer margin. Hind wing orange. 18 mm. This species differs from *S. effoetana* by the orange hind wing, from *S. flavedana* by the smooth fore wing and much larger size."

Olethreutidae

Olethreutes albimaculana (Walsingham) has been identified by Mr. Aug. Busck from material intercepted at light at Bayamón.

Olethreutes anthracana was described by Prof. Wm. T. M. Forbes (1931-347) from a single male from El Yunque which has "head and thorax blackish; fore wing coal black outwardly; a contrasting yellow discal dot," as illustrated in his painting (fig. 2).

Olethreutes canofascia was described by Prof. Wm. T. M. Forbes (1930-86) from a great abundance of material reared by Mr. Thos. H. Jones in

October 1913 and by Mr. E. G. Smyth in July 1916 from "light olive green larvae, the contents of alimentary canal darker, head light brown" webbing together the leaflets of *Phyllanthus lathyroides* at Río Piedras. It has been intercepted at Bayamón and collected at Manatí, but not found elsewhere in Puerto Rico. It is a little brown moth, 12–14 mm. in wing expanse, with a complicated pattern on the forewing in three lighter irregular oval areas.

Olethreutes hebesana (Walker) is a continental North American species, of which the larva is "a stem borer in various herbs. (The adult is) mottled dull brown, the middle of the costa darker," reported by Prof. Forbes (1930-88) from Coamo and collected by him on Vieques Island. Another species of this genus, as identified by Mr. Carl Heinrich, has been reared from larvae intercepted on *Psidium guajava* at Corozal.

The adult reared from larvae intercepted on fruit of "almendra" (*Terminalia catappa*) at Arecibo has been identified by Mr. Carl Heinrich as a species of *Laspeyresia*.

Bactra verutana Zeller is a clay-colored moth "with some fuscous striation, especially on veins and barring toward the margins; with blackish shade-spots, often obsolete, toward base and end of cell," which Prof. Forbes (1931-350) identifies from five Puerto Rican localities and from Vieques Island.

Episimus argutanus (Clemens) is a continental and West Indian species which Prof. Forbes (1931-350) collected on Vieques Island. It is "brown, mottled, with purple iridescence when fresh; a few submarginal black dots towards costa; larva a rather general feeder."

Mr. Aug. Busck identified as a species of *Episimus*, possibly his *guiana*, a moth intercepted on squash at Bayamón.

Gymnandrosoma desotanum Heinrich, originally described from adults reared from larvae in red mangrove seed (*Rhizophora mangle*) found in the Florida Everglades, is identified by Prof. Forbes (1931-349) from his collection of adults on Vieques Island.

Gymnandrosoma trachycerus was described and illustrated in fig. 1 of his colored plate by Prof. Wm. T. M. Forbes (1931-349) from a holotype male, a fuscous and blackish moth from El Yunque, with a wing expanse of 15 mm.

Ethelgoda texanana (Walsingham), as determined by Mr. Carl Heinrich, is a little gray moth, reared from "jumping beans," the infested seeds of "yaiti" (*Gymnanthes lucida*) collected at the Garrochales Forest Station at Arecibo, September 1944. It was "described from Texas, but is undoubtedly of tropical origin, this being the first Puerto Rican record," according to Mr. Heinrich. Mr. Muesebeck writes that "Dr. Bottimer reared this insect in 1929 from seed pods of *Stillingia sylvatica* at Lake Alfred, Florida."

An inconspicuous little brown moth, with no obvious markings, of which the larva webs together and feeds on the tender leaves of "María" (*Calophyllum antillanum*) found in the spring of 1940 near Laguna Tortuguero, as reported by Dr. Luis F. Martorell (1948-114) who reared the material, was determined by Prof. Wm. T. M. Forbes as a new species of *Episimus*.

Anchyloptera viridisdorsana was described as a *Phoxopteryx* by Herr Heinrich B. Möschler (1890-334) from two specimens collected in Puerto Rico by Dr. Gundlach, and listed by him. Prof. Forbes (1930-89) collected it at San Germán and on Vieques Island. It is an orange-ochre moth, "shaded with green, a triangular green patch on inner margin of fore wing; hind wing gray with three metallic strigules near margin; 8–10 mm."

Thiodia autochthones Walsingham was collected by Prof. Forbes (1931-350) at San Germán, and he records collection by Dr. M. D. Leonard and Mr. A. S. Mills at Cataño and Aguirre. It is "mouse grey, strigulated; the most conspicuous mark being an ochreous patch near anal angle, containing two black dots, preceded by lead gray and followed by a whitish spot, a continuous black basal line in fringe; 8 mm."

Eucosma longipalpana was described as a *Grapholitha* by Herr Heinrich B. Möschler (1890-333) from a single male collected in Puerto Rico by Dr. Gundlach, and listed by him. It is a pale yellow moth, not since found anywhere.

Eucosma strenuana (Walker), originally described as a *Grapholitha* from Santo Domingo, Prof. Forbes (1930-90) collected at Coamo and Isabela in Puerto Rico and on Vieques Island. It is a smoky moth, "more or less dusted with white," of which the "larva (is) a stem-borer in *Ambrosia*."

Crocidosema plebeiana Zeller is a common, tropicosmopolitan, mottled brown moth, collected on Culebra Island by Mr. Aug. Busck in 1899, and by Prof. Forbes (1931-350) on Vieques, and taken at light at many localities in Puerto Rico. It has been reared from larvae intercepted in seed-heads of *Sida cordifolia* at Vega Alta, by Mr. A. S. Mills.

Strepsicrates smithianus Walsingham, as identified by Mr. Aug. Busck, was reared by Mr. E. G. Smyth at Río Piedras during the summer of 1916 from guava (*Psidium guajava*), together with some Braconid parasites which were not identified. Prof. Forbes (1930-91) records collection at Naguabo and on El Yunque, describing the adult as "dark brown, inner margin light gray, outer part of costa mottled with light gray; hind wing translucent blue-gray, with smoky border and veins."

Heligmocera calvifrons Walsingham was collected by Prof. Forbes (1930-92) on El Yunque. The "base and disc (of the fore wing is) largely dull rose, outer part and inner margin olive green, shaded and mottled with blackish; 14 mm."

Balbis excitana was described as a *Grapholitha* by Herr Heinrich B. Möschler (1890-333) from a single female collected in Puerto Rico by Dr. Gundlach, and listed by him. Don Julio García-Díaz (1938-96) lists it, identified with some doubt by Prof. Forbes, as having been collected by him in some aquatic environment, possibly on El Yunque.

Epinotia unica Heinrich is listed by Prof. Forbes (1931-351) as having been collected by him at Isabela, a single undersized male.

Phaloniidae

Saphenista bunteoides was described and illustrated (fig. 3 of his colored plate) by Prof. Wm. T. M. Forbes (1931-353) from material from Coamo, having the head, thorax and basal portion of fore wing cream-colored. It has since been found by Dr. W. A. Hoffman at Utuado.

Saphenista lepidulana was described and illustrated (fig. 4 of his colored plate) by Prof. Wm. T. M. Forbes (1931-354) from specimens he had collected at Coamo, El Yunque and from Vieques Island, the "ground of the fore wing darker ochreous and more even."

Saphenista multistrigata Walsingham-Durrant is identified by Prof. Forbes (1931-354) from specimens collected by him at Coamo and on El Yunque, and by Dr. W. A. Hoffman at Jájome Alto.

Saphenista semistrigata was described and illustrated (fig. 5 of his colored plate) by Prof. Wm. T. M. Forbes (1931-355) from material he collected on El Yunque and from Coamo, the fore wing having "a defined olive streak." This has been reared by Mr. A. S. Mills from larvae intercepted on *Pluchea purpurascens* at Pt. Cangrejos. Other species of this genus have been collected at light on El Yunque, or intercepted at light at Bayamón.

Phalonia distigmatana Walsingham, originally described from St. Vincent and Grenada, was collected on January 1899 by Mr. Aug. Busck at Bayamón, and has since been taken at Isabela by Prof. Forbes (1931-355). It is a cream-colored moth with fawn-brown markings, a wing expanse of 9 mm.

Phalonia prolectana was described as a *Cochylis* by Herr Heinrich B. Möschler (1890-332) from a single female collected in Puerto Rico by Dr. Gundlach, and listed by him. It has not since been found anywhere.

Phalonia subolivacea Walsingham was collected at Bayamón in January 1899 by Mr. Aug. Busck. It is presumed that it was this "tiny brown and white moth" which Mr. E. G. Smyth during the summer of 1916 at Río Piedras reared from flower heads of *Erechthites hieracifolia*, and it was definitely identified as this species which Mr. A. S. Mills intercepted at Dorado and Guayama in flower heads of "margarita" (*Bidens pilosa*). Prof. Forbes (1930-95 and 1931-355) records collection from seven Puerto

Rican localities and from Vieques Island of this moth "creamy white with olivaceous markings."

Phalonia tectonicana was described as a *Cochylis* by Herr Heinrich B. Möschler from a single specimen collected in Puerto Rico by Dr. Gundlach and listed by him. It has not since been found anywhere.

Phalonia vincinitana was described as a *Cochylis* by Herr Heinrich B. Möschler (1890-333) from a single male collected in Puerto Rico by Dr. Gundlach, and listed by him. This pale yellow moth marked by with brown has not since been found anywhere. The little moths reared from larvae boring in the buds of dahlias at Río Piedras in the summer of 1922, causing them to wither, were identified by Mr. Aug. Busck as a species of *Commophila.*

Cossidae

Psychonoctua personalis Grote was described by Dr. C. W. Hooker (1913-35) as "a lepidopterous borer, determined by Dr. H. G. Dyar as *Psychonoctua* sp., which was reported as the 'coffee stem-borer' by Mr. W. V. Tower (1908-27) as boring in orange, citron, rose-apple and sweet-al-

Larva of *Psychonoctua personalis* Grote in its tunnel in the coffee trunk. Natural size. (Drawn by F. Sefn.)

mond, has done considerable damage, where the trunks and larger branches of the coffee plants are riddled with canals." In his summary of the "Insects Affecting Coffee in Porto Rico" (Jour. Ec. Ent., **10** (6); 513–517. Concord, December 1917), Mr. R. H. Van Zwaluwenburg noted that it is "most often found in old coffee at altitudes up to 1,500 feet," and recommends pruning and burning invaded wood for control, giving Dr. Dyar's determination of *Psychonoctua jamaicensis* Schaus. It was subsequently identified by Dr. Wm. Schaus as *Xyleutes muricolor* Dyar MS, but male genitalia studies unite *P. personalis* Grote, *P. jamaicensis* Schaus and the Porto Rican race under the name of the Cuban species. Altho individuals may occur in the higher coffee groves, as at Indiera, Lares and Villalba, serious injury has been noted only at lower elevations, as at Vega Baja, Quebradillas and Aguadilla, and the most severe attack was on coffee growing in an experimental plot on the grounds of the Mayagüez Experiment Station under *Gliricidia* shade. Mr. T. B. McClelland had planted this on level land, intending to run fertilizer experiments without the complica-

tions due to uneven contour of commercial groves, but the damage by these borers was so excessive that the experiment had to be abandoned. Apparently the moths normally and by preference occur close to sea-level, and attain a much greater size in shoots of "mangle" (*Laguncularia racemosa*), as around Laguna San José in 1938, than they do in coffee. They have also been found attacking croton bushes at Río Piedras, and Prof. J. A. Ramos (47-51) found them in seagrape (*Coccoloba uvifera*) on Mona Island. In coffee trees, infestation may cause warty growths somewhat similar to that produced by heavy infestations of the "hormiguilla," but in mangrove, no indication of infestation appeared until the exit tunnel was formed. The pupal skin of the insect is left in the tunnel when the moth emerges. It is "gray with inconspicuous light brown markings," of great variation in size, some individuals having a wing expanse of two and a quarter inches, others not measuring even an inch from tip to tip.

Hyponomeutidae

Urodus sordidata was described as a *Trichostibas* by Herr P. C. Zeller (Horae Societatis Entomologica Rossicae, xiii, p. 233. 1877), the type from Puerto Rico, and apparently it has not since been found anywhere.

Hyponomeuta triangularis was described by Herr Heinrich B. Möschler (1890–339) from two males collected in Puerto Rico by Dr. Gundlach, and listed by him. Prof. Forbes (1930–99) calls this *Yponomeuta* one of the "Small Ermine Moths," and it is indeed silvery white, "Vorderflugel weissgrau mit 21 schwarzen Punkten" according to the count by Herr Möschler, altho some individuals have 27 or more black spots on the fore wing, if one counts the smallest ones. The larvae have been found making nests between leaves of "coscorrón" (*Elaeodendron xylocarpum*) at Boquerón, Arecibo, Pt. Salinas and Loíza Aldea, and indeed may be expected wherever this shrub or tree occurs along the beaches. As noted in "Insectae Borinquenses" (1936-484), "the full-grown larva is 14 mm. long, with an orange-yellow head. Body is canary yellow; an irregular medio-dorsal black spot on each abdominal segment, laterally bordered with white, lateral of which is a much larger irregular, black, grey-bordered spot. On the second and third thoracic segments, these large later spots are broken in two by median white bands; on the first segment are two black crescents only. True legs black, spiracles black, lateral hairs with black areas at base, prolegs black and white banded."

Euarne obligatella was described by Herr Heinrich B. Möschler (1890-340) from a single female collected in Puerto Rico by Dr. Gundlach, and listed by him. It has not since been found anywhere.

Plutella maculipennis (Curtis), the cosmopolitan diamondback moth of cabbage, was identified by Herr Möschler from a single male collected in

Puerto Rico by Dr. Gundlach, which he thought "enteramente parecido a los europeos; era acaso introducido." It has become much more abundant since, and was noted by Mr. O. W. Barrett (1904-448) on cabbage, and by Mr. W. V. Tower (1908-35) on cabbage, kale, mustard and turnips. Mr. Thos. H. Jones (1915-9) gives an illustration of an injured mustard leaf, and Dr. Richard T. Cotton (1918-281) illustrations of all stages and considers it "the worst insect pest of cabbage in Porto Rico." It occurs in all parts of the Island, and has been repeatedly taken at light, even in areas where no cruciferous vegetables are grown, as in Guajataca Gorge, but Dr. Hoffman's collection at El Semil is hardly surprising, as larvae have been intercepted on brocolli at Villalba. Control in the past has been exceptionally difficult because of the unadhesiveness of most chemicals to the waxy cabbage leaf. Pyrethrum dust has given control, if used when fresh, but DDT dust is even more effective, and for the present at least can be recommended without reservation for use by cabbage growers until something more desirable is synthesized by the organic chemists. Prof. Forbes (1930-100) describes the adult as "brown, the inner margin of the fore wing in the male contrastingly paler, taking the form of a series of overlapping half-diamonds, female with the same markings but not contrasting."

Glyphipterygidae

Tortyra aurofasciana (Snellen), originally described from the Island of St. Martin in the Lesser Antilles, was listed as a *Choregia* by Herr Möschler, identifying two males from Puerto Rico collected by Dr. Gundlach, and listed by him. Prof. Forbes (1930-102) notes collection at Guánica and Guayanilla, and (1931-356) by Dr. M. D. Leonard on Vieques Island.

Brenthia pavonacella Clemens seems to bear a singularly appropriate specific name, altho it actually holds its dark brown wings in a manner quite the reverse of that of a strutting turkey, displaying their upper surfaces marked and spotted with white, and iridescent lavender spots on the outer margin of the fore wings. It was listed from Puerto Rico by Dr. Gundlach and Herr Möschler, and is quite common in coffee groves and even in citrus groves, resting on low vegetation. Mr. Carl Heinrich, identifying adults from Indiera, Adjuntas and Utuado, added that the larva "feeds on *Amphicarpea*," and in November 1931, Mr. Francisco Seín found them abundant, feeding on the underside of the leaves of the coffee shade tree, *Inga vera*, at Lares. Most recently at Mayagüez, Mr. H. K. Plank (1945-27) found them a serious pest on soybeans.

Heliodinidae

Heliodines quinqueguttata Walsingham was collected on Culebra Island by Mr. Aug. Busck in February 1899, and is reported by Prof. Forbes

(1931-356) from Dorado and Aguirre. He describes the moth as being "golden-orange, fore wing with three bronzy spots on costa, alternating with two on the inner margin; apical third of fore wing edged with bronzy; 8.5 mm."

Cosmopterygidae

Batrachedra albistrigella was described by Herr Heinrich B. Möschler (1890-345) from a single specimen collected in Puerto Rico by Dr. Gundlach, and listed by him. It is "light gray-green striped with white, the hind wing mostly white," according to Prof. Forbes (1930-107), and has not subsequently been found anywhere.

Mr. Francisco Seín, studying the insects present in ripening and mature pineapple fruits as they might be implicated with the excessive production of gum exudations from injured (or uninjured) portions of the fruit, found that the most common small caterpillar present was a species of **Batrachedra**. Prof. Forbes thought that it might be a new species, but Mr. J. F. Gates Clarke identified it as "near, if not **mathesoni** Busck," originally described from Florida, where its larvae were found on the blossoms of the coconut palm. These minute little elongate silvery-gray moths have prominent black eyes, the markings on the fore wings consisting only of a single submedian spot. Mr. Seín found exudations of gum from areas eaten into the base of the fruit by the caterpillars, from near-by such areas, and also from portions of the fruit far distant from caterpillar injury, indicating only a facultative connection between gumming and the *Batrachedra* larvae. His preliminary report is entitled "Estudio del Daño causado por los Insectos a las Piñas" (*in* Informe Bienal, 1940–42, pp. 83–85. Río Piedras, 1944). Mr. Mario Pérez, continuing the studies, found decisive reduction in gumming and caterpillar injury following spraying with chlordan.

Cosmopteryx antillia was described by Prof. Wm. T. M. Forbes (1931-356) from Coamo, "closely similar to *C. mimetis*," which was the identification he (1930-108) had formerly given to these specimens.

Cosmopteryx attenuatella (Walker), as identified by Mr. Aug. Busck, was intercepted in the metropolitan area, and Prof. Forbes (1930-107) records collection at Coamo. The adult has "antenna with four segments at tip white, then five black, one white and one black."

Cosmopteryx gemmiferella Clemens was identified with some doubt by Herr Möschler, as Dr. Gundlach had but a single injured specimen from Puerto Rico, and Prof. Forbes "strongly suspects" that it was *C. attenuatella*.

Cosmopteryx sancti-vincenti Walsingham is listed by Prof. Forbes (1930-108) from Coamo and El Yunque.

Cosmopteryx similis Walsingham was collected by Prof. Forbes (1930-108) on Vieques Island and at Coamo.

Triclonella rhabdophora was described and illustrated by Prof. Wm. T. M. Forbes (1930-135) from a type collected by him on St. Thomas, others from Vieques Island. It is a small, narrow-winged, ochre yellow moth, striped with dark brown.

Pyroderces stigmatophora (Walsingham), extensively recorded in economic literature as *Pyroderces rileyi* (Walsingham), and thus first identified from Puerto Rico by Mr. J. D. More, has a slender pinkish larva, often found in old cotton bolls, and because of the color, often confused with the pink bollworm of cotton. In Puerto Rico, it has been most often collected in old cotton bolls because of the intensive studies made on pink bollworm, but it also attacks seed corn, and is known as the pink corn worm. Dr. M. D. Leonard (1932-131) records its interception by Mr. A. S. Mills on dry cowpea stems from Vieques Island, and it has repeatedly since been found heavily infesting the heads of only partially mature sorghum on the PRACO farm on Vieques Island. It was not found by Mr. Aug. Busck when he was in Puerto Rico in 1899, but he has repeatedly identified it from here since, and he is responsible for a most extensive critical discussion of what he calls "the scavenger bollworm" (pp. 362-366) in his technical paper on "The Pink Bollworm, *Pectinophora gossypiella*" (Jour. Agr. Research **9** (10): 343-370, fig. 7, pl. 6, ref. 48, Washington, D. C., June 4, 1917). "Aside from the color of the larva, there is only a superficial resemblance between it and the pink bollworm; and even the color is somewhat different—much deeper and more reddish. Full grown, it is much smaller than the pink bollworm, and appears more hairy because of the proportionally longer setae." The adult has very narrow wings, and is quite different in general appearance from the pink bollworm adult. Large numbers were found killed in the Isabela ginnery after its interior had been sprayed with 5% DDT in kerosene, but this is hardly a commercial method of control, even in instances where control is considered desirable. The old cotton bolls and stored corn attacked are usually valueless by the time injury is noted, but some preventive to its attack on ripening sorghum is needed if this is to be grown commercially on Vieques Island.

Homaledra sabalella (Chambers), as determined by Mr. Aug. Busck, is much more obvious in the injury caused by the feeding of its caterpillars on the underside of palm leaves, and the web of loose silk, in which most of its brown excrement becomes entangled, than as whitish caterpillar, or as elongate grey-brown adult. Injury to the areca palm has not been noted, nor to the royal palm, but to the coconut palm is sometimes so severe as to be of commercial importance, and such ornamental palms as the fan palms (*Coccothrinax argentea*, *Neowashingtonia robusta* and *Livistona chinensis*), are ruined from the standpoint of appearance. The imported cahoun palm, the oil palm (*Elaeis guineensis*), the sugar palm

(*Arega saccharifera*), and the native mountain palm (*Euterpe globosa*) are also attacked. This may be an endemic insect, altho its range extends to Hispaniola and Florida. The caterpillars are attacked by two species of *Spilochalcis*, but this by no means results in even commercial control. Spraying ornamental palms with nicotine sulfate will prevent re-infestation for a considerable period, but does not bring back the original appearance of injured leaves, and they should be cut off and removed even if all living caterpillars have already left them. The insect occurs in all parts of the Island, mountain-palms being attacked on El Yunque, and coconut palms at Guánica and on Vieques Island, but it is not reported from Mona. Prof. Forbes (1930-109) describes adults as being "clay color, with black dots in fold and at end of cell; 15 mm."

Prochola fuscula was described by Prof. Forbes (1931-357) from a type collected by him on Vieques Island, others from Coamo: a little fuscous moth, 8 mm. in wing spread.

Perimede annulata Busck was identified with some doubt by Prof. Forbes (1931-358); a single female from Cataño, "deep bronzy brown-black, with four raised scale-tufts on fore wing."

Perimede purpurescens was described by Prof. Forbes (1931-358) from a single female collected by Mr. Francisco Seín at Lares, "umber brown, the thorax and fore wing with decided iridescence, in most lights violet blue, but changing to crimson; immaculate; last ten segments of antennae white."

Eriphia curvipunctella (Walsingham) is listed as an *Eritarbes* from Puerto Rico by Prof. Forbes (1930-110) collected by Mr. R. H. Van Zwaluwenburg, but later he (1931-360) admits "I am not sure of my identification" of specimens from Isabela, Coamo, Santurce and Vieques Island.

Eriphia pernigrella was described by Prof. Wm. T. M. Forbes (1931-360) from a coal black type which he had collected on Vieques Island.

Eriphia quinquepunctata was described by Prof. Wm. T. M. Forbes (1931-360) from a type collected by him on Vieques Island, others from Coamo, a fuscous moth; "the scales with contrasting whitish bases and with whitish underscaling, so that the moth becomes steadily paler as it gets rubbed, and may become almost clay color." It has been collected at light at El Semil, Villalba, by Dr. W. A. Hoffman, in May 1940, and also on El Yunque.

Stilbosis phaeoptera was described by Prof. Wm. T. M. Forbes (1931-361), a "dark umber brown" moth, of which he collected the type from Coamo, another from El Yunque, and has a specimen from Surinam.

Aphanosara planistes was described by Prof. Wm. T. M. Forbes (1931-362), a whitish moth of which he collected the type from El Yunque, and painted the fore wing, see fig. 10 of his plate.

Blastobasidae

Blastobasis argillacea Walsingham, as identified by Prof. Forbes (1930-112) was collected by Mr. J. D. More as a brown scavenger caterpillar in cotton bolls injured by the pink bollworm, at Fajardo and between Guayama and Salinas on February 10, 1922, and reared by him to adult. It is a mottled moth, "with red-brown shading and contrasted fuscous scaling," as described by Prof. Forbes (1931-363) from material collected by Dr. W. A. Hoffman in Santurce, and by himself at Coamo and on Vieques Island.

Blastobasis subolivacea Walsingham, as determined by Prof. Forbes (1931-363), has "the fore tarsus as well as tibia fuscous, pale banded" in the specimens from Coamo; "more doubtful are a pair from Vieques Island, and a very dark specimen from Aguirre." It is "olive gray, shading to brownish outwardly; 12 mm.," according to Prof. Forbes (1930-112), who suspects "that a specimen bred from sorghum belongs to this species." Mr. Carl Heinrich has identified as a species of *Blastobasis* some moths which Messrs. R. G. Oakley, A. S. Mills and F. A. Vitrano reared from larvae intercepted on heads of grain sorghum being grown on the PRACO farm on Vieques Island, May 28, 1948. A previous identification of moths obtained from sorghum heads from Vieques Island a year and a half previously was *Holcocera* sp.

Auximobasis constans Walsingham was found by Prof. Forbes (1931-363) on Vieques Island, as was also *Auximobasis flaviciliata* Walsingham. "All my female material is *flaviciliata*, male *constans*, but Walsingham claims to have males of both."

Auximobasis insularis Walsingham was collected by Prof. Forbes (1931-0363) on Vieques Island.

Auximobasis variolata Walsingham was collected by Mr. Aug. Busck on Culebra Island in February 1899, and by Prof. Forbes (1931-363) on Vieques Island on April 1930, and at Coamo.

Prof. Forbes (1931-363) "cannot distinguish offhand from the North American *Pigritia ochrocomella*" moths collected by Dr. W. A. Hoffman at Palmas Abajo and by himself at Coamo and Lares.

Gelechiidae

Sitotroga cerealella (Olivier), the Angoumois grain moth, was first found in Puerto Rico by Dr. Richard T. Cotton in August 1917 attacking corn at Río Piedras. In November 1921 injury was widespread and serious to the grains of ripening corn at Vega Alta. The conditions under which it became so abundant as to attract notice can not be determined, for the insect is comparatively rare in Puerto Rico, and has been intercepted only once, resting on weeds at Cidra. Prof. Forbes (1930-116) describes

the moth as being "straw color, with obscure darker dots and shades; hind wing dark."

Œcia œcophila (Staudinger), as identified by Prof. Forbes (1930-115), was originally determined by Mr. Carl Heinrich as *Œcta maculata* Walsingham for Mr. J. D. More, who in January 1923 reared a single specimen from refuse in an "old cockroach jar." This is the only record for Puerto Rico.

Tholerostola evippella was described by Prof. Wm. T. M. Forbes (1931-364) from an abundance of material from Isabela, Coamo and San Germán, a "fuscous and cream white" moth, with a wing expanse of 7 mm.

Aristotelia absconditella (Walker) was collected by Prof. Forbes (1931-367) at Coamo.

Aristotelia diolcella was described by Prof. Wm. T. M. Forbes (1931-366) from an abundance of material collected by him on Vieques Island, others from Coamo, San Germán and Palmas Abajo, and mentioned by him as being from Puerto Rico in "The Rubidella Group of *Aristotelia* (Lepidoptera, Gelechiidae)" (Jour. N. Y. Ent. Soc., **40** (4): 423-433, pl. 1. New York, December 1932.). He has since identified it for Prof. J. A. Ramos (1947-51), who collected "several specimens at light, March 4, 1944, Sardinera Beach," Mona Island.

Aristotelia lignicolora was described by Prof. Wm. T. M. Forbes (1931-368) from a male collected by him at Coamo, mostly clay-colored, "characterized by an enormous penis."

Aristotelia penicillata Walsingham, originally described from Hispaniola, is identified by Prof. Forbes (1931-369) from his collections at Coamo and Isabela, which show "the '*Eucatoptus*' hair-pencil very strikingly." This moth is "ochreous with mottling and complex markings of grayish fuscous, whitish and some metallic gray; apex with some rosy; 10 mm."

Aristotelia picticornis Walsingham was collected by Prof. Forbes (1931-368) at Coamo.

Aristotelia vagabundella was described by Prof. Wm. T. M. Forbes (1931-365) from an abundance of material which he collected on Vieques Island, others from Isabela, Coamo and Aguirre.

Glaucacna iridea was described by Prof. Wm. T. M. Forbes (1931-369) from material which he collected on El Yunque, a dull ochre moth with a wing spread of 8 mm., of which his painting of the fore wing is fig. 15 of the colored plate.

Empedaula rhodocosma (Meyrick) was identified by Prof. Forbes (1931-370) from material he collected at Coamo and San Germán.

Prof. Forbes collected a specimen of *Eucordylea* at San Germán "in too poor condition to describe satisfactorily."

Epithectis annulicornis (Walsingham) was collected by Mr. Aug. Busck

on Culebra Island in February 1899, and by Prof. Forbes (1931-371) on Vieques Island in April 1930, and at Coamo Springs.

Epithectis eromene (Walsingham) is identified by Prof. Forbes (1931-370) from Santurce, Aguirre and Coamo, and a pale strain from Vieques Island. "Larva on *Bromelia pinguin*."

Epithectis kittella (Walsingham) "I think I recognize from El Yunque" writes Prof. Forbes (1931-371).

Schistophila fuscella was described by Prof. Wm. T. M. Forbes (1931-371) from a single type from El Yunque, mostly luteous or fuscous, with a wing spread of 11 mm.

Telphusa distictella was described by Prof. Wm. T. M. Forbes (1931-372) from a specimen collected at San Germán by Dr. M. D. Leonard, mostly "light dull gray" in color, with a wing spread of 10 mm."

Telphusa perspicua (Walsingham) was collected by Prof. Forbes (1931-372) on Vieques Island and at Coamo. It is "blackish-brown, contrastingly marked with yellow."

Trichotaphe (Cymotricha) pectinella was described by Prof. Wm. T. M. Forbes (1931-372) from a type he collected at Coamo which is "deep iron gray, with faint browny iridescence."

Trichotaphe (Onebala) elliptica was described by Prof. Wm. T. M. Forbes (1931-373) from a type which he collected on Vieques Island which is "ash gray," marked with contrasting cream yellow. The blackish fore wing is represented in fig. 19 of the colored plate.

Trichotaphe (Onebala) melissia (Walsingham) is identified by Prof. Forbes (1931-373) from Río Piedras and El Yunque. According to Mr. Aug. Busck, in Barbados its larva is a pest on sweet potatoes.

Trichotaphe manella was described as an *Ypsolophus* by Herr Heinrich B. Möschler (1890-344) from a single female collected in Puerto Rico by Dr. Gundlach, and listed by him. According to Prof. Forbes (1930-121), this moth is "dark violet, brown, with a costal yellow stripe, triangularly widened a third way out." It has been intercepted resting on pomarrosa at Barceloneta.

Mr. Aug. Busck identified as a new species of *Trichotaphe* a small grey moth with thick orange antennae, a large black spot near base of fore wings, which emerged from a pupa taken at Río Piedras in February 1923. He wrote that the "larva is a leaf-roller on *Inga vera* and is apt to be a fine, highly-colored larva."

Eunebristis zingarella (Walsingham), reared from round mines in the leaves of seagrape (*Coccoloba uvifera*) at San Juan in February 1899 by Mr. Aug. Busck was listed as a *Dichomeris* in "Insectae Portoricensis" (1923-202). It has since been reared from the same host at Mameyes, the adults having been identified by Prof. Forbes. Such mines are not es-

pecially common, but may locally occur in great abundance. The adult moth is "ochreous, mottled with brick red, with steel blue streaks and fringe; 9 mm.," according to Prof. Forbes (1930-120).

Dichomeris indignus (Walsingham) was collected by Prof. Forbes (1931-374) at Coamo and on El Yunque, and by Dr. W. A. Hoffman at Jájome Alto. It is "pale rufocinerous, somewhat mottled and powdery."

Dichomeris piperatus (Walsingham) was first noted in the spring of 1930 by Mr. L. A. Serrano at the Isabela Sub-Station, feeding on the tender leaves of alfalfa and webbing together the tips of the shoots. Mr. Francisco Seín reared some of these larvae to adult, had them identified by Prof. Forbes, who was in Puerto Rico at the time, and wrote "Insectos que atacan la Alfalfa en Puerto Rico" (Rev. Agr. P. R., **25** (2): 91. San Juan, 1930) and "*Dichomeris piperatus* Walsingham, a Pest of Alfalfa in Puerto Rico" (Jour. Ec. Ent., **23** (5): 885-6, Geneva, October, 1930). In subsequent years these caterpillars were much less abundant on alfalfa than in the first year that it was grown at Isabela, and indeed did little damage after this first attack. Presumably the caterpillars may feed on the leaves of other legumes, for Prof. Forbes (1930-121) notes collections of adults at Santurce, Cataño, and Coamo, and on Vieques Island, and they have been intercepted at light at Bayamón.

Dichomeris rusticus (Walsingham), as identified by Mr. Aug. Busck, has been intercepted at light at Bayamón. Dr. Stuart T. Danforth (1926-100) noted at the Cartagena Lagoon an unidentified species of *Dichomeris* eaten by the yellow-shouldered blackbird.

Thiotricha sciurella (Walsingham) was found by Prof. Forbes (1930-122) on Vieques Island. He describes the adult as being "silvery white; dark shades grayish; orange spot large, but not reaching dorsum; radiating orange and fuscous stripes in fringe below apex; 8 mm."

Polyhymno luteostrigella Chambers is "silvery white with longitudinal brown stripes, and oblique ones near the caudate apex; 9 mm.," according to Prof. Forbes (1930-123). It has been intercepted at light at Bayamón and Comerío and Prof. Forbes (1931-374) lists additional collections at Río Piedras, Cataño, Lares and Isabela, and by himself on Vieques Island.

Brachyacma palpigera (Walsingham) was found by Dr. M. D. Leonard and Mr. A. S. Mills, while collecting data for "A Preliminary Report on the Lima Bean Pod-Borer and other Legume Pod-Borers in Porto Rico" (Journ. Ec. Ent., **24** (2): 466-473. Geneva, April 1931), to occur in considerable abundance in dry pigeon pea pods grown along the north coast, or at Cabo Rojo. Often over half of these larvae were parasitized by *Paralitomastix* sp. nov., as determined by Mr. A. B. Gahan. They also found larvae in dry pods of *Crotalaria retusa* at Pueblo Viejo and Bayamón, and caterpillars have since been noted in old pods of *Crotalaria incana* at

Loíza Aldea, scavengers in pods previously occupied by larvae of *Etiella zinckenella*. The elongate, slender, whitish larvae are quite different in appearance from the plump greenish pod-borers which are primary in their attack on these hosts, and they transform to adults which Prof. Forbes (1930-123) describes as with "fore wing shading from pale ochreous to fawn brown, with a dark shade from middle of costa to apex, sometimes cut by two oblique white lines, and three dark dots on disc; 10–18 mm." Mr. H. K. Plank, in Reports of the Mayagüez Station (1937-74 and 1938-71), noted these caterpillars feeding on leaves of *Tephrosia candida* and *T. toxicaria*, and abundant in their pods during the summer. Adults have been taken at light at San Juan, and repeatedly at Bayamón, Prof. Forbes reporting (1931-374) collections made by him at Coamo and on Vieques Island.

Anacampsis (Commatica) bifuscella was described by Prof. Wm. T. M. Forbes (1931-375) from a type collected by him at Coamo, others from San Germán, Isabela and El Yunque. This is "a rather distinct little thing; ash gray, faintly yellowish and powdered lightly with fuscous scales."

Anacampsis (Anacampsis) insularis Walsingham was found by Prof. Forbes (1931-375) on El Yunque. The moth is "grayish fuscous, with three white costal blotches, the third nearly meeting a blotch on inner margin; a series of connected darker spots in fold, fringe whitish; 8 mm."

Two new but undescribed species of *Anacampsis* (*Anacampsis*) are listed by Prof. Forbes (1931-375), and Mr. Aug. Busck has thus identified adults reared from hibiscus buds intercepted at Vega Alta.

Anacampsis (Compsolechia) mangelivora Walsingham has a flesh-colored larva with brown head, which webs together two leaves of "mangle" (*Rhizophora mangle*). Prof. Forbes (1930-125) reports its collection on St. Thomas, and (1931-377) doubtfully reports its collection on El Yunque. No mangrove grows on El Yunque, but the adult of a caterpillar feeding on mangrove might be blown there from the mangrove swamps on the beach at Mameyes.

Anacampsis (Compsolechia) melanophaea was described by Prof. Wm. T. M. Forbes (1931-376, fig. 16) from a male from El Yunque (TYPE) and a duller colored female from Coamo, both collected by him.

Anacampsis (Compsolechia) meibomiella was described by Prof. Wm. T. M. Forbes (1931-376, fig. 17) from a light ash grey adult, reared from *Meibomia* in Cuba, and a "paler smoother looking, and more lightly marked" specimen from San Germán, Puerto Rico.

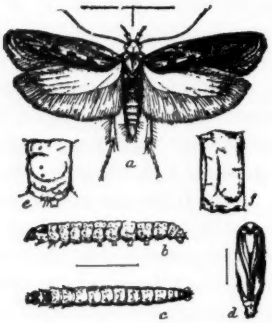
Anacampsis (Compsolechia) plumbeolata Walsingham is identified by Prof. Forbes (1931-377) from a non-typical specimen he collected at Coamo.

Gnorimoschema gudmannella (Walsingham), the pepper flower-bud moth, altho known from the Virgin Islands since before 1923, when Mr.

Charles E. Wilson reported it as one of the "Truck-Crop Insect Pests in the Virgin Islands" (Bulletin No. 4, Virgin Islands Agr. Expt. Station, pp. 35, fig. 24, Washington, D. C., 1923), was not noted in Puerto Rico until April 1940, when Mr. Francisco Seín found its larvae "abundant on buds and in flowers of cultivated pepper and 'ají' at Río Piedras," after specific inquiry by Mr. E. R. Sasscer if it might not be present here. His intensive studies were reported as "Oruga de la Flor del Pimiento" (*en* Informe Bienal, 1940-2, p. 91, Río Piedras, 1944). Its larvae are heavily parasitized, Mr. A. B. Gahan identifying as new a species of *Euderus* (Entedontidae) and a new species of *Copidosoma* (Encyrtidae), two of the parasites obtained. The latter is by far the most common and widely-distributed of the parasites, present at all seasons of the year everywhere that Mr. Seín collected the infested flower buds. Mr. C. F. W. Muesebeck identified two Braconid wasps; a species of *Chelonus*, and *Apanteles dignus*, which he had described from material reared from *Gnorimoschema lycopersicella* (Busck) at Santa Ana, California. Despite this heavy parasitism, the caterpillars are very abundant, and are responsible for a heavy drop of flower buds. It is doubtful, however, if pepper plants could develop more fruit than they actually produce commercially, and this heavy pruning of buds may be beneficial. As the fruits are not infested under Puerto Rican conditions, the presence of the pepper flower-bud moth does not involve quarantine restrictions on commercial shipments to continental markets. Prof. Forbes (1930-126) describes the adults as being "powdery gray, with white-tipped scales and a few ochre spots, three of four of them centered by a few black spots; costal pencil present in male; 8—10 mm."

Gnorimoschema operculella (Zeller), the potato tuberworm of continental United States, but in tobacco-growing regions known as a leaf-miner, or locally called "candela" or "candelilla," was not reported from Puerto Rico by Drs. Stahl or Gundlach, and indeed may not have been present here at the time they were collecting most intensively. As *Gelechia picipella*, it was reported by Mr. O. W. Barrett (1905-396) causing "slight damage to tobacco at Aguas Buenas." Under the older and more familiar generic name of *Phthorimaea*, Dr. Richard T. Cotton (1916-299) noted damage to eggplant, but this is quite exceptional. "Nuevas Cosechas, Nuevas Plagas" (Rev. Agr. P. R., **23** (2): 84–86. San Juan, 1929) is Mr. Francisco Seín's account of attack on Irish potatoes. Commercial injury in Puerto Rico is practically confined to tobacco, and this only during periods of more or less extended drought. The little greenish caterpillars feed on the interior layers of young tobacco leaves, the outer tissues becoming papery and yellowish-brown soon after the growing larva has extended its feeding to fresh areas. When fully-grown, the larva often becomes pinkish or purplish, pupating in trash or debris on the ground. The in-

conspicuous little brownish adult Prof. Forbes (1930-127) does not bother to describe. During the daytime it rests quietly on the ground or in debris, quickly seeking shelter if disturbed, but is doubtless active during the night, the females laying individual eggs on suitable hosts. Because the caterpillars feed on the inside of leaves, they are not susceptible to poisoning with arsenicals, but heavy rainfall quickly rots their burrows, exposing them to attack by predators and parasites and forcing them to eat poisoned tissue in starting a new mine. Indeed, all stages of the insect appear to be very susceptible to rainfall, and infestations drop to a minute fraction of 1% after heavy rains. Even under normal weather conditions infestations rarely become serious, but with continued scarcity of rain



The Tobacco Leaf-Miner or "Candela," *Gnorimoschema operculella* (Zeller): *a*, adult, *b* & *c*, larvae, *d*, pupa, *e*, *f*, segments of larva enlarged. (Redrawn from Riley and Howard, U. S. D. A.)

little may be left of young transplants except root, stem and midribs. If such weather were normal, tobacco growing would be possible only with overhead irrigation. The commercial tobacco regions, however, usually have ample rainfall to keep leaf-miner injury to a minimum, and it is the marginal regions, more subject to drought, where heaviest losses are most likely to occur. In the past, artificial control has been almost impossible, but the newer insecticides, especially DDT, may make control possible, even when climatic conditions are most unfavorable for the tobacco grower. This is a cosmopolitan pest, present everywhere in Puerto Rico except in the most humid regions, and Prof. Forbes (1931-377) records collection of adults at light by Dr. W. A. Hoffman at Jájome Alto, as well as by himself on Vieques Island.

Gnorimoschema striatella (Murtfeldt) is listed by Prof. Forbes (1930-127) as having been reared from "larva in berries of *Solanum*, pale green-

ish yellow with five irregular and interrupted crimson stripes, and shining dark brown head, true legs and cervical shield." Whether this refers to his record of collection at Fajardo, Jan. 19, 1914, is uncertain, but a subsequent record (1931-377) is of collection of adult at Cataño.

Gelechia exclarella was described by Herr Heinrich B. Möschler (1890-343) from a single specimen from Puerto Rico collected by Dr. Gundlach, and listed by him. It has not since been found anywhere.

Gelechia salva Meyrick was collected by Prof. Forbes (1931-377) at Coamo and San Germán.

Stegasta bosquella (Chambers) var. **costipunctella** was described as a species of *Gelechia* by Herr Heinrich B. Möschler (1890-344) from a single specimen collected in Puerto Rico by Dr. Gundlach, and listed by him. This is a widely distributed species, of which, according to Prof. Forbes (1930-128), "Porto Rico specimens are noticeably smaller than those from the United States, and the patch on the inner edge while normal in form varies from pink to a dark brown, hardly paler than the ground. Purple-gray, the patch on inner margin tawny or pinkish and connected as a rule to the antemedial costal spot. 12 mm. Larva green, with crimson thorax and chitinized parts black; on *Cassia*." Adults have been intercepted at light at Bayamón, and Prof. Forbes (1931-377) collected them at San Germán and on Vieques Island. Mr. Francisco Seín found them at Lares.

Stegasta capitella (Fabricius) was described from Puerto Rico as *Gelechia rivulella* by Herr Heinrich B. Möschler (1890-344), the type a single specimen collected by Dr. Gundlach, and listed by him. It was collected on Culebra Island by Mr. Aug. Busck in February, 1899, by Prof. Forbes (1931-377) at many localities in Puerto Rico and on Vieques Island, and identified by him for Prof. J. A. Ramos (1947-51) who took specimens at light on Mona Island. It is "a common species, dark brown, spots and band on inner margin white; fringe mainly white; 8 mm. Walsingham believed that the type was taken on St. Croix," where recent collections have been made by Mr. Harry A. Beatty.

Pectinophora (or **Platyedra**) **gossypiella** (Saunders), the pink bollworm of cotton, was first found in Puerto Rico as an empty pupal case in an injured boll of tree cotton at Humacao, August 13, 1921, by Mr. Ignacio Torres. This was identified by Mr. J. D. More, and his identification confirmed by Mr. Carl Heinrich, but there was no question about the identity of the insect, and subsequent determinations were made by Mr. More as long as he remained in Puerto Rico. He examined all material collected on trips around the Island which showed that even in 1921, "The Distribution of the Pink Bollworm in Porto Rico" (Circular No. 85, Insular Expt. Station, pp. 7, map. San Juan, September 1923) extended from Cabo Rojo all along the south and east coasts as far as the Cabezas de San Juan, and along

the north coast from Dorado to Aguadilla. This included all the principal cotton-growing areas of the Island, and spread in 1922 was not more than ten or fifteen miles from known areas of previous infestation, mostly to plants of wild or volunteer cotton. An anonymous report on the observations of Mr. Aug. Busck (Service and Regulatory Announcements, Federal Horticultural Board, July–December 1921, No. 71, pp. 95–178. Washington, D. C., 1922) indicated that the appearance of the pink bollworm in the Lesser Antilles was due to the importation of infested seed from Egypt into the Island of St. Croix in 1911–12, whence it reached Puerto Rico ten years

Exit Hole and typical Injury to Cotton Boll caused by the Pink Bollworm, *Pectinophora gossypiella* (Saunders). (Drawn by F. Seín.)

later. Due to the earlier appearance of the pink bollworm in the British Islands, the Puerto Rican cotton industry has enjoyed exceptional prosperity, growing Sea Island cotton for the manufacture of thread in England, and the discovery of this new and insidious pest demanded a strict enforcement of control measures if cotton growing was to be continued. Within the next ten years twenty-six publications dealing wholly or in part with this pest appeared, as listed in "Insectae Borinquenses" (1936-492 to 495), with attendant publicity that induced one local satirical columnist to sign his communications "Pink Bollworm." Mr. Juan Pastor Rodríguez wrote "Nuestra Industria Algodonera se ve Amenazada por un Insecto Peligroso" (El Imparcial Dominical, pp. 29–30, fig. 1. San Juan, May 23, 1937), and Mr. L. Courtney Fife, who had been sent to Puerto Rico to make ob-

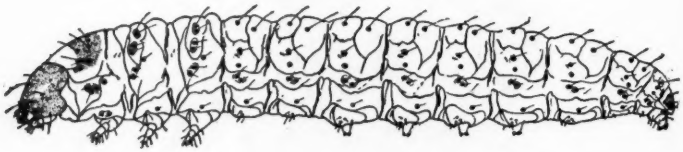
servations exclusively on this insect, recorded the "Status of the Pink Bollworm in Puerto Rico during 1935–36" (Jour. Agr. Univ. P. R., **21** (2): 233–235. San Juan, July 1937). Seeds of the endemic "maga" (*Montezuma speciosissima*), an especially important cabinet-wood tree because its wood is more resistant to dry-wood termite attack than is mahogany, are often heavily infested by pink bollworm larvae after cotton has been harvested, and "The Infestation of Young Okra Pods by Pink Bollworm in Puerto Rico" (Jour. Dept. Agr. P. R., **15** (4): 395–398. San

Infestation by the Pink Bollworm, *Pectinophora gossypiella* (Saunders), in the Seed Pods of Maga, *Montezuma speciosissima*. (Drawn by G. N. Wolcott.)

Juan, 1931) may indeed become total if grown near infested cotton. Mr. Fife's observations on "Alternate Host Plants of the Pink Bollworm in Puerto Rico" (Jour. Agr. Univ. P. R., **22** (4): 483–492, ref. 18. San Juan, March 23, 1939) gives additional data on this point.

"Studies of the Diapause in the Pink Bollworm in Puerto Rico" (Technical Bulletin No. 977, U. S. D. A., pp. 26, fig. 7, ref. 56. Washington, D. C., January 1949) by Mr. L. Courtney Fife showed that "under Puerto Rican conditions pink bollworms in the diapause always occur most abundantly during periods of drought, regardless of the age of the crop or

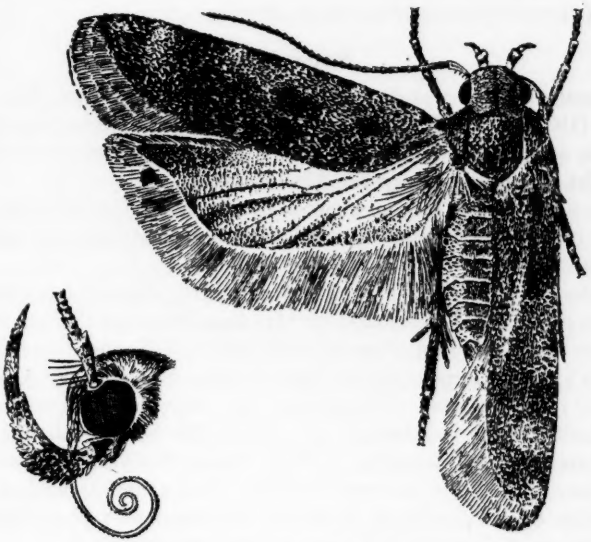
the time of the year at which the drought takes place. A few resting larvae always occur in the field regardless of the amount of rainfall—an indication of the existence of an inherited cycle which cannot be broken within several generations. A low relative humidity combined with a high temperature reduces the water content of the larvae by evaporation, thereby decreasing the rate of metabolism and causing arrested development. Dry food caused by drought conditions, i.e., lack of rainfall, high temperatures, low humidity, excessive wind movement, high evaporation, and lack of available moisture for the plants, reduces the water content of the larvae themselves. Moisture is the most important factor terminating the diapause under tropical conditions; and in the field, under conditions of heavy rainfall and high temperature, pupation and emergence of a majority of the resting larvae would be completed within two and a half to three months."



The Pink Bollworm of Cotton, *Pectinophora gossypiella* (Saunders), eight times natural size. (After Busck, U. S. D. A.)

Two native wasps, a small Bethylid (*Perisierola* sp. nov., near *nigrifemur*) and an Ichneumonid (*Calliephialtes ferrugineus* Cushman), have been found to attack pink bollworm larvae, but neither is abundant, and they are of negligible importance in control. "Through the cooperation of the Divisions of Cotton Insect Investigations and Foreign Parasite Introduction of the Bureau of Entomology, three species of pink bollworm parasites were introduced during 1935, 1936 and 1937, namely *Exeristes roborator*, *Microbracon kirkpatricki*, and *Chelonus blackburni*. These parasites were reared by L. W. Noble and W. T. Hunt at the Presidio, Texas, station of the Division of Cotton Insect Investigations, and were received and liberated by K. A. Bartlett of the Puerto Rico Station." Tens of thousands of these parasites were released and "Dr. Bartlett reports that all species were recovered at points of liberation within a few months after they were released," according to Mr. Fife (1939-4), but none was found in succeeding years. The completeness of the failure of natural control of the pink bollworm in Puerto Rico by means of parasites is matched by the inefficiency and ineffectiveness of the recommended agricultural practices and clean-up after the harvesting of the crop. Indeed, the later ob-

servations of Dr. Luis F. Martorell were to show that neither control measures nor alternate hosts were of such vital importance as propinquity to the ginnery at Isabela, which proved to be the major source of re-infestation for the succeeding crop. As the near-by farmers became aware of this, they ceased planting cotton, making impossible a continuation of observations on comparative infestation, but incidentally furnishing most convincing proof of its menace. Spraying the interior of the ginnery with 5% DDT in kerosene might have been effective in killing all emerging moths if



Adult and side view of head of adult of the Pink Bollworm, *Pectinophora gossypiella* (Saunders), ten times natural size. (After Busck, U. S. D. A.)

doors and windows had been kept closed, but as they had to be kept open for the reception of the crop and for the comfort of the workers, it was very largely nullified by the conditions under which the ginnery operated. To be sure, many pink bollworm moths, and possibly larvae and pupae, as well as various stages of numerous other insects, were killed by the single spraying of its interior August 31, 1945, but not in sufficient numbers to justify the adoption of such a procedure under any practical method of operation. A more modern ginnery, or its removal to outside of the cotton region, seems to be the most obvious remedy. The pink bollworm has been present on Mona Island quite as long as it has been in Puerto Rico, for the

light-house keeper took infested Egyptian seed from St. Croix there when such seed was first available, and the insect has survived on wild cotton to date. An intensive and costly wild cotton clean-up on Vieques Island, initiated just before World War II that Sea Island cotton might be grown there, may have been successful in eradicating pink bollworm, but no cotton was planted when the Navy and the PRACO took over the Island.

Most recent spraying tests conducted at Isabela indicate that commercial control of the pink bollworm can be obtained by spraying with DDT at two week intervals when squares begin to form. It is yet to be shown that any other of the new insecticides is more effective.

Stenomidae

Mothonica ocellea was described and illustrated by Prof. Wm. T. M. Forbes (1930-130 to 132), the type from Guatemala, others from Mexico, Panama, and Naguabo in Puerto Rico. The moth is "clay color, shading into light wood-brown; expanse 17–24 mm."

From seeds of *Inga vera* intercepted by Mr. A. G. Harley at Mayagüez, moths were reared which Mr. Carl Heinrich identified as a species of *Stenoma*.

Schistonoea fulvidella (Walsingham), originally described as a *Brachmia* (?) from St. Thomas, was found by Mr. Aug. Busck on Culebra Island in February 1899, by Prof. Forbes (1931-378) on Vieques Island in April 1930, and at San Germán, Isabela and Coamo, and by Dr. W. A. Hoffman at Dorado and Santurce. The moth is "pale ochreous, more or less heavily shaded with tawny and brown, and scaled with black; with fuscous terminal bars; 15 mm.," according to Prof. Forbes (1930-120), who continues, apparently quoting the observations of Mr. Gudmann, "larva dark brown, with white tubercles, (living) in a web decorated with bits of dead leaf, grass, etc., in the concave leaf-bases of *Bromelia pinguin*."

Ethmiidae

Ethmia abraxasella (Walker), first described as a *Psecadia* from Santo Domingo, was redescribed as *Psecadia aureoapicella* by Herr Heinrich B. Möschler (1890-341) from numerous specimens of both sexes collected in Puerto Rico by Dr. Gundlach, and listed by him. Mr. E. G. Smyth collected sixty-seven of these small speckled moths, as identified by Mr. Aug. Busck, at light at Hda. Santa Rita, Guánica during the latter half of 1913. In Van Zwaluwenburg's list it is PR 1403. Prof. Forbes (1930-134) notes additional collections at Coamo, and describes the moth as "white, with several black spots and brown shades on costa and a patch on inner margin; a golden dot nearly surrounded with black in middle of fold and another below apex on outer margin; hind wing translucent gray; 16 mm." Mr.

Francisco Seín took adults at light at Lares, but nothing is known as to the host plant of the larva.

Ethmia confusella (Walker) was re-described by Herr Heinrich B. Möschler (1890-343) as *Psecadia ingricella* from numerous specimens of both sexes collected in Puerto Rico by Dr. Gundlach, and listed by him. Mr. E. G. Smyth collected seventy-three of this "speckled gray" moth, as identified by Mr. Aug. Busck, at light at Hda. Santa Rita, Guánica, during the latter half of 1913, two-thirds of them taken in October. It is P. R. 1404 in Van Zwaluwenburg's list. It was taken by Mr. Aug. Busck on Culebra Island in February 1899, by Prof. Forbes (1931-379) on Vieques Island in April 1930, and noted by him as common at Coamo and San Germán. Altho the moth appears grey, it is really white with numerous black dots and dashes on the body and fore wings; the hind wings translucent white; expanse 20 mm.

Ethmia joviella Walsingham was collected at Río Piedras by Dr. M. D. Leonard, and at Isabela by Prof. Forbes (1931-379), who describes it as being "smaller than the other Puerto Rican species; white, fore wing with about eight black dots; hind wing gray with white fringe; 14 mm."

Ethmia kirbyi was described as a *Psecadia* by Herr Heinrich B. Möschler (1890-342) from a pair collected in Puerto Rico by Dr. Gundlach, and listed by him. Prof. Forbes (1930-133) collected several at Coamo which he described as "white with numerous gray spots, fusing into costal and dorsal marginal stripes towards apex; marginal stripe golden in male, absent in female; 16 mm."

Ethmia notatella (Walker), listed as *Psecadia xanthorrhoa* Zeller from Puerto Rico by Herr Möschler and Dr. Gundlach, was identified under this specific name by Mr. Aug. Busck for Mr. E. G. Smyth, who collected forty-five of this "speckled white" moth at light at Hda. Santa Rita, Guánica, during the latter half of 1913. It is *Ethmia xanthorrhoa* Zeller, P. R. 1405 in Van Zwaluwenburg's list. Prof. Forbes notes collection at Coamo (1930-133) and at Curaçao, and in Hispaniola. Dr. Luis F. Martorell collected many adults at light on Mona Island, both at the lighthouse and at Camp Kofresí, and Prof. J. A. Ramos (1947-51) also found it abundant. This striking moth has a wing expanse of 25 mm., black eyes, its white thorax and fore wings spotted with black; hind wings translucent grey, darker at apex, fringed with white; abdomen grey.

Ethmia nivosella (Walker) was first listed from Puerto Rico by Herr Möschler and Dr. Gundlach as *Psecadia adustella* Zeller, and this specific name was given by Mr. Aug. Busck to Mr. E. G. Smyth, who collected fifty-five of these "brown and white" moths at light at Hda. Santa Rita, Guánica, during the latter half of 1913. In Van Zwaluwenburg's list it is P. R. 1402, *Ethmia adustella* Zeller. Adults have been intercepted at

Bayamón. They have a dense tuft of erect white hair on their head; body, base of fore wing and very large dorsal patch dark brown, with traces of purplish iridescence; outlines of these spots, costal and apical margins and hind wings grey.

Coleophoridae

Coleophora picticornis Walsingham, as identified with some doubt by Mr. J. F. Gates Clarke, was collected at light by Dr. W. A. Hoffman at El Semil, Villalba, May 10, 1940.

Coleophora pulchricornis Walsingham was collected by Prof. Forbes (1930-138) at Coamo and on Vieques Island. He describes the adult as being "dull fawn, with a whitish costal streak and some streaks on veins outwardly; a black and white streak below costa and a small streak or two small streaks towards apex, 10 mm. Larva in a straight case ("cigar-case"), with mouth set on at an angle and with a three-keeled apex." While making observations on "The Minor Sugar-Cane Insects of Porto Rico" (Jour. Dept. Agr. P. R., **5** (2): 5–47, fig. 19. San Juan, April 1921), "a large number of case-bearer larvae and pupae (identified by Mr. Aug. Busck as a species of *Coleophora*) were noted on cane plants 12–24 inches high, May 13, 1920, in a field on a shelf of the Espinosa hill road from the Toa Valley. No indication of their feeding on cane was observed, but some plants had as many as eight on a single shoot. A few specimens had previously been found on cane, farther down the valley at Toa Baja and Dorado, from which parasites emerged determined by Mr. A. B. Gahan as a species of *Microplectrum*."

Gracilariidae

Spanioptila spinosum Walsingham was found by Prof. Forbes (1931-380) at Coamo. It is "white, with some transverse dark flecking and faint yellowish shades; a dark streak in apical fringe; 10 mm."

In the Mayagüez Station Report for 1939 (1940-115), a leaf-miner in the leaves of *Tephrosia* spp. is noted, identified by Mr. Aug. Busck as a new species of *Phyllonorycter*.

Acrocercops albomarginata (Walsingham) was found by Prof. Forbes (1930-142) at Coamo.

Acrocercops cymella is described and illustrated (his fig. 23 of the colored plate) by Prof. Wm. T. M. Forbes (1930-380) from a type he collected at Coamo. It is "a striking species; fore wing white, marked with shining fuscous gray; 13 mm."

Acrocercops dives (Walsingham), as identified by Prof. Forbes (1930-141), was collected at Mayagüez by Mr. R. H. Van Zwaluwenbürg. It is "brilliant metallic bronze; forewing with an orange patch on costa contain-

ing a black and bronze costal spot before middle, and one at end of cell, beyond which the wing is duller golden; base of costa black, 8 mm." Mr. Francisco Seín reared the larvae, which are blotch-miners, from the leaves of *Inga vera* at Lares, in October 1936. Mr. Aug. Busck determined the reared adults, and Mr. C. F. W. Muesebeck identified a parasite as a new species of *Microbracon*.

Acrocercops inconspicua was described by Prof. Wm. T. M. Forbes (1930-142) from a type reared from larvae mining in the leaves of "péndula" (*Citharexylon fruticosum*) at Yauco in January 1923. It is a minute moth, with a wing spread of only 5 mm., "gray with black spots."

Acrocercops pontifica was described and illustrated (fig. 24 of his colored plate) by Prof. Wm. T. M. Forbes (1931-380), the type from El Yunque, "ochre yellow, marked with silver."

Acrocercops rendalli (Walsingham), originally described from Jamaica, is with some doubt identified by Prof. Forbes (1930-142) as being the moth reared by Mr. Thos. H. Jones from larvae mining in the leaves of a Malvaceous weed at Río Piedras. The adult is "buff, transversely banded with silver, antemedial and medial band very broad, postmedial narrow, and apex again white." It has recently been reared by Prof. James G-. Needham at Río Piedras from larvae mining the leaves of hibiscus.

Acrocercops sanctæcrucis (Walsingham) was originally described from St. Croix, as is indicated by the specific name, but is not noted as a pest of eggplant by Mr. Charles E. Wilson (1923-21), nor even listed by Mr. Harry A. Beatty in his "Fauna of St. Croix, V. I." (Jour. Agr. Univ. P. R., **28** (3–4, July–October, 1944): 103–185. Río Piedras, July 7, 1947). The reddish larvae, making linear mines at first in the leaves of eggplant, and later blotch mines with characteristic puckering of the uneaten leaf around the mine, were first noted in Puerto Rico by Dr. Richard T. Cotton at Río Piedras in the spring of 1916. He reared adults which were identified by Mr. Aug. Busck, but his account (1918-300) of this pest gives little indication of how serious it may at times become, for he says "the parasites of this insect are very abundant and keep it well under control at all times." Indeed, the insect is so small that one can hardly think of it as being much of a pest, yet when several caterpillars occur in the first, full-sized leaf put out by the young seedling, nearly all of its surface may be invaded. If conditions are favorable for the continued growth of the plants, no perceptible injury results, but in seed-beds not kept watered and thinned, many seedlings die, presumably in part at least because of this leaf-miner. Rarely are mines to be noted on the leaves of older plants, and injury, except in the seed-bed, is negligible. No method of artificial control has been tested, but presumably nicotine sulfate would be effective, and most certainly DDT and some of the newer insecticides. The heavy infestation

recorded was at Isabela in January 1932, but mines have also been noted in *Solanum torvum* at Río Piedras. Prof. Forbes (1931-380) lists collections of adults at Coamo and Las Cruces (Cidra), adding, "Mr. Busck tells me that *A. undifraga* Meyrick, from Haiti, bred from *Solanum torvum*, is a synonym of this species." The adult is a beautiful little moth, the wings of which are dark brown with four silvery spots, two of which are triangular, edged with black (making a cross across the back—another explanation of the specific name), and when at rest are kept tightly folded around the abdomen. The little moth seems to have disproportionately large legs and antennae, and it fearlessly stands up on its hind legs at a sharp angle quite different in manner from the clinging, crouching habits of many insects.

Acrocercops zebrulella was described and illustrated (figs. 21 and 22 of his colored plate) by Prof. Wm. T. M. Forbes (1931-381) from types and paratypes collected by him on El Yunque. It is "a striking little thing," its fore wing white and light buff or yellow with pattern in dull black.

Prof. Forbes (1931-382) notes "three more species of *Acrocercops* from Porto Rico not suitable for description." He suspects another, "with grey-barred borders," reared from the smaller mines in the leaves of seagrape (*Coccoloba uvifera*) at Mameyes in February 1936, as being new. Mr. J. F. Gates Clarke gave no specific identification to the moths of this genus which Dr. Luis F. Martorell reared in 1940 from material collected from "escambrón colorado" (*Pithecellobium unguis-cati*) on the Cayey-Salinas road, and later in the year from "capá prieto" (*Cerdana alliodora*), in the same region.

Gracilaria aeneocapitella Walsingham, originally described from the Island of St. Vincent, Prof. Forbes (1931-382) has identified from Lares. The adults he describes as being "tawny, the costa except at base golden yellow, with purple iridescence and dark brown flecking, especially on costa and towards apex."

Lyonetiidae

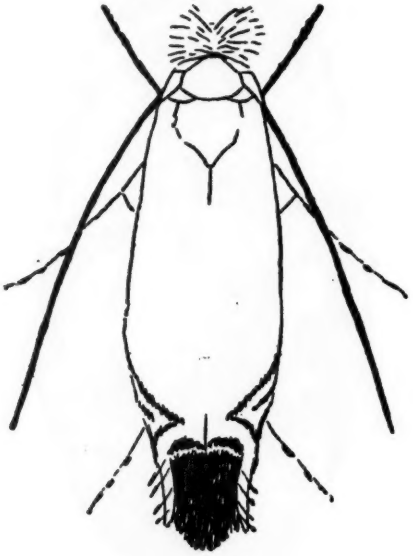
Mr. Aug. Busck identified as a species of *Bucculatrix* the moths which Dr. Luis F. Martorell (1948-135) reared from very numerous small caterpillars feeding on the leaves of "ceiba" (*Ceiba pentandra*) north of Aguadilla, in October, 1940, causing an incomplete but heavy defoliation. Each caterpillar was under a white silken net, feeding on the leaf surface, sometimes breaking thru and making a hole in the leaf. When fully-grown the caterpillar spun a light grey, ribbed cocoon attached to the midrib of the leaf, from which the adult emerged leaving the empty pupa case half out of the entrance.

Leucoptera coffeella (Guérin-Méneville), the cosmopolitan coffee leaf-miner, was not noted in Puerto Rico by Drs. Gundlach or Stahl, the first record for the Island being by Mr. O. W. Barrett, in his first report as Entomologist and Botanist (*in* Ann. Report P. R. Agr. Expt. Station for

Injury to Coffee Leaf by the Miner Caterpillars of *Leucoptera coffeella* (Guérin-Méneville). (Drawn by G. N. Wolcott.)

1903, pp. 429–450. Washington, D. C., 1904). By the next year (1905-397) he had discovered that its caterpillars were parasitized by the minute wasp *Chrysocharis livida* Ashmead, and by the following year (1906-22) had reared another parasite, *Zagrammosoma multilineata* Ashmead. The

Coffee Specialist at the Mayagüez Station, Mr. J. W. Van Leenhoff, reported (1906-46) that severe attacks caused shedding of the leaves, and Dr. C. W. Hooker (1913-14) noted abundance of the caterpillars. Mr. R. H. Van Zwaluwenburg made intensive studies, as reported from year to year, summarizing the results in his paper on the "Insects Affecting Coffee in Puerto Rico" (Jour. Ec. Ent., **10** (6): 513–517. Concord, December, 1917), and listing the leaf-miner as number 602 in his list. When



Adult of the Coffee Leaf-Miner, *Leucoptera coffeella* (Guérin-Méneville), twenty-five times natural size. (Drawn by G. N. Wolcott.)

Mr. Edmundo Colón, as Director of the Insular Experiment Station, initiated a survey of the coffee industry, Mr. Francisco Seín eagerly commenced studies which were continued almost up to the present, but of which the results were for the most part reported by others in one or two paragraphs in each annual report of the Insular Station. The preliminary Circular No. 52 (pp. 12, fig. 6. Insular Experiment Station, Río Piedras, October 1921) attempted to summarize all that was known of "El Minador de las Hojas del Café." In "An Economic Entomology of the West Indies" (1933-330 to 338) is an extensive, illustrated account. Mr. Seín went to Haiti to discover why the leaf-miner was so scarce there, and later

visiting some of the Lesser Antilles, discovered in Guadaloupe the parasite, which Mr. C. F. W. Muesebeck named *Mirax insularis*, which attacks from sixty to eighty-five per cent of all the leaf-miner caterpillars. Introduced into Puerto Rico, it managed to survive at Lares, but only in one recent exceptionally dry year has it become as abundant as the native parasites. Mr. Seín found that these native parasites are not as common in the principal coffee regions as Mr. Barrett found them at Mayagüez, and that their combined effect in natural control is negligible. The important factor is humidity: ridges exposed to the full force of the drying wind having heavy infestations, while protected humid ravines a short distance away have trees practically free from mines. Artificial control in seed-beds can be obtained by spraying with nicotine sulfate, but this is hardly practical after the trees have been set out in their permanent position in the grove. The only host of the leaf-miner is Arabian coffee, and everywhere in the Island that host trees are present, infestation by the leaf-miner will be noted. The adult is a little satiny-white moth, its forewings outwardly margined with a darker pattern, its head with a spreading tuft of white hairs. Mr. Seín made numerous paintings, but no comparable, carefully-worked out drawings that could be reproduced in black and white. The moth shows a strong "A Reaction to Light Intensity" (Ecology, **3** (1): 86. Brooklyn, January 1922) as do the caterpillars when they chose a place in which to spin their cocoons. All observed ecological relations to environment and parasites are given in "A Quintessence of Sensitivity: The Coffee Leaf-Miner" (Jour. Agr. Univ. P.R., **31** (3-July 1947): 215–219. Río Piedras, Sept. 19, 1950).

Oinophilidae

Taeniodictys sericella was described by Prof. Wm. T. M. Forbes as one of "Two Wasp-Guests from Puerto Rico (Microlepidoptera)" (Psyche, **40** (3): 89–91. Pl. 1. Cambridge, September 1933), the type reared by Mr. Francisco Seín from nests of *Polistes crinitus* at Lares.

Mr. Aug. Busck has identified as a species of *Opogona* the moths reared from larvae which are scavengers in old leaves of coconut palm previously infested with *Homaledra sabalella* (Chambers). Prof. Forbes (1930-148) thinks that "it is closely related to *O. rhynchacma* Meyrick, of Brazil, but appears to be distinct." The Puerto Rican sugar-cane bud moth, the same or another species of *Opogona*, develops from "a small grey-brown caterpillar with a black head, which eats the eyes of cane and makes superficial tunnels in the rind of the cane stalk near the nodes, and in the inside of the leaf-sheaths, when burrowing between the stalk and the leaf-sheaths. During 1914–16, in examining a large number of fully-grown stalks of cane in all parts of the Island, it was found to have made tunnels or eaten into

the eyes of 1.2 per cent of all stalks examined. It can not be considered a pest of very great importance, as it does not burrow far enough into the rind of the cane to cause an appreciable loss of juice, and the eyes chewed into are usually far enough down on the stalk so that they go to the mill to be ground and are not on the seed-top. It is also so scarce that it would not be noted unless large numbers of stalks are inspected."

Tischeriidae

Tischeria heliopsisella Chambers is Prof. Forbes' re-determination (1930-150) of the moths which Mr. Thos. H. Jones reared from leaf-miners in *Piper?* sp., found on El Yunque in December 1912. The adult has a "fore wing with two transverse bands of fuscous dusting."

Psychidae

Oiketicus kirbyi Guilding, the West Indian bagworm, presumably originally described from Jamaica, was first listed from Puerto Rico by Herr Möschler (1890-122)—a single male in the collection of Dr. Staudinger, not seen by Dr. Gundlach—and from Cuba, "Raupe auf Persea gratissima, Cupania, Terminalia u.s.w." The larva of this bagworm is an omnivorous feeder, Dr. Luis F. Martorell (1948-545) listing over a dozen additional trees on which it is recorded or he found it feeding, and this does not include the introduced ash trees (*Fraxinus*, sp.) on which it was noted at Cayey and Maricao, or leafless trees that could not be identified in the Guánica Forest. Indeed, it rather appears to prefer introduced trees, for it was noted on beefwood (*Casuarina equisetifolia*) at Arecibo, Guánica and on Mona Island, and for several years was very abundant on "ciprés" (*Thuja orientalis*) around the lily pool at the Forest Station, Río Piedras. The lizards *Anolis pulchellus* and *Anolis cristatellus* swallow the larva inside its bag, and are apparently able to sever its connection with the host twig. Presumably the bag, and the bits of leaf, twig and other vegetable debris adorning its exterior, are undigestible, but it hardly seems possible that lizards would eat enough of these bagworms to eliminate an infestation, yet no other natural enemy is known. Dispersion to fresh hosts is difficult, for the female is a naked maggot "that never leaves the cocoon. The male of the Porto Rican species has an enormous extensible abdomen with which to fertilize her," according to Prof. Forbes (1930–150). He is of the opinion that dispersion occurs among the young larvae which drift with the wind immediately after hatching.

Tineidae

Ereunetis aeneoalbida Walsingham was collected at Aguirre by Dr. M. D. Leonard and at San Germán by Prof. Forbes (1931-382). He

(1930-148) describes it as having "antennae yellowish, vertex brassy; three costal brassy streaks and one dorsal on fore wing; 8 mm., snow white, with two fasciae near base, and oblique ones toward apex, and a longitudinal black line."

Ereunetis minuscula Walsingham, as determined by Mr. Aug. Busck, was reared by Mr. Thos. H. Jones from larvae "working under scales on papaya" at Río Piedras in November 1912; by Dr. Richard T. Cotton from larvae "feeding on purple scale in citrus grove" at Río Piedras in January 1917, and by Dr. M. D. Leonard (1932-1106) feeding on cottony cushion scale. Mr. Busck wrote to Dr. Cotton that "this species is a very general feeder, and one of the most abundant Micros in the West Indies and Florida. It has been bred from scale insects before, but I doubt that it is really predaceous on the scale; it is more likely merely a scavenger, which incidentally eats the living scale. I have bred the species in large numbers in Cuba from refuse in a coconut warehouse, and from dry "mummy" fruit of loquats in Florida." When the survey was being made of the dispersion of pink bollworm, it was repeatedly found as a scavenger in injured cotton bolls, Mr. J. D. More rearing adults, as determined by Mr. Carl Heinrich, from collections at Mameyes, Humacao and Fortuna (Ponce). Larvae have been found in old cotton lint at Vega Baja, in dry okra pod at Vega Baja, in partitions of pods of *Thespesia populnea* at Guayanilla, in old coconut palm leaves at Río Piedras, and intercepted in cowpeas on Vieques Island. Adults have been repeatedly intercepted at light at Bayamón. Prof. Forbes (1930-147) describes the moth as being "light wood color, with oblique darker bands; base of male hind wing transparent."

Ereunetis particolor Walsingham, as identified by Mr. Aug. Busck, was collected at Río Piedras in January 1923 by Mr. J. D. More, a single specimen resting on a pink bollworm rearing box.

Setomorpha insectella (Fabricius), as identified by Mr. Aug. Busck, was first noted in Puerto Rico by Mr. D. L. Van Dine, who found the larvae developing on paprika at Río Piedras in May 1912. Mr. Francisco Seín later thought them to be scavengers in the abandoned nests of paper wasps, and Prof. Forbes (1930-152) notes that "The larva is a tropical and warm-temperate pest in stored food, and is especially injurious to potatoes," altho not so recorded in Puerto Rico. The adult he describes, as "dull luteous, spotted with gray," repeatedly intercepted at light at Bayamón.

Tiquadra aeneonivella (Walker) was first listed from Puerto Rico by Herr Möschler (1890-338) as *Tiquadra aspera* Zeller, identifying several specimens for Dr. Gundlach. "Nach Berg, lebt die Raupe in einem langlich ovalen Sack." A large grey moth reared from a pupa found in a rotten

Erythrina tree at Cayey in November 1922 was identified as *Tiquadra inscitella* Walker by Mr. Aug. Busck, but is re-determined by Prof. Forbes (1930-152), who thinks "The Porto Rican species may well be new." The male he describes as "cream-colored, with numerous light grey spots; female much larger, pearl gray with larger, darker gray spots. Hind wing of male whitish with a pale brassy lustre; that of female gray. 25–35 mm."

The moth reared from a creamy white, unmarked caterpillar living in a dead and rotten underground stem of sugar-cane at Río Piedras in January 1915, was identified by Mr. Aug. Busck as a species of *Amydria*, possibly his *umbraticella* (Proc. U. S. National Museum, **47:** 64. Washington, D. C., 1914).

Myrmecozela ochraceella Tengström, reported from Puerto Rico by Herr Möschler and Dr. Gundlach, Prof. Forbes (1930-154) considers "undoubtedly an accidental introduction from Europe." It has not since been found locally.

Achanodes antipathetica was described by Prof. Wm. T. M. Forbes (1931-384) from a type male collected by Dr. W. A. Hoffman at Santurce, others from San Germán, Isabela, Coamo, Dorado, San Juan and the Island of Vieques, with light and dark forms, "dull ochre to light wood brown, more or less dusted with fuscous; 9 mm." Don Julio García-Díaz (1938-96) also collected this moth when making his survey of fresh water insects.

Antipolistes anthracella was described by Prof. Wm. T. M. Forbes (1933-92) from type material from Lares reared by Mr. Francisco Seín from nests of the paper wasp, *Polistes crinitus* Felton.

Tineola walsinghami, the plaster bagworm, was described by Mr. Aug. Busck on page 188 of his "Microlepidoptera of Cuba" (Entomologica Americana of Brooklyn Ent. Soc. **13** (4): 151–202, pl. 7. Lancaster, 1933), the type from St. Thomas, but present generally in the West Indies and southern Florida. *Tineola uterella* Walsingham, originally described from Brasil, is considered by Mr. Busck to be distinct from the West Indian species, altho most of the references are under that name, and indeed the original identification from Puerto Rico as such was by Mr. Busck. Not especially abundant in wooden houses, the flattened cases of this bagworm appear in surprisingly large numbers on the walls of freshly finished concrete buildings, with grains of sand and flecks of cement attached to the outside of the silken bag. What the caterpillar inside can find to eat is a mystery to many people, for most housekeepers feel sure that not enough dead insects, spider skins and other debris can possibly occur on new walls to support such a population of bagworms. In this they are quite correct, for woolen clothes in storage and especially woolen blankets when not in constant use are attacked, as may be noted in the Forest Service camps on

El Yunque, at El Verde, and at Camp Kofresí on Mona Island. Even cotton clothes may have holes eaten in them at times, for the bagworms hide in wicker laundry hampers, and in wardrobes which can not be closed tightly enough to exclude them, or are carelessly left open. Prof. J. R. Watson considers what he named "the plaster bagworm" a most serious pest of woolen rugs, and in Florida Press Bulletin No. 536 (pp. 2. Gainesville, 1939) recommends control by means of fresh pyrethrum powder, or soaking or spraying the rugs with a solution of pyrethrum in water-white kerosene. *Tineola biselliella* (Hummel), the webbing clothes moth, and *Tinea pellionella* (L.), the casemaking clothes moth, may be temporarily present in Puerto Rico by introduction, but neither has been identified from local collecting. *Apanteles carpatus* Say, the common parasite of the continental clothes moths, is however, present in Puerto Rico and presumably attacks the plaster bagworm. The crested lizard, *Anolis cristatellus*, when living in the house, may swallow the insect, bag and all, as it hitches its way along. Dr. Stuart T. Danforth (1926-122) reports finding this bagworm eaten by the northern water thrush, but presumably this is of rare occurrence. The rarely noted adult, as described by Prof. Forbes (1930-154), is "yellowish fawn, with some purplish fuscous dusting, and a few purplish fuscous spots; 10–15 mm."

Tinea brevistrigata Walsingham was collected on Culebra Island in February 1899 by Mr. Aug. Busck, in April 1930 by Prof. Forbes (1931-388) on Vieques Island, and by Dr. M. D. Leonard and Mr. A. S. Mills at Aguirre. It has the "dorsal half of wing grayer than costa; four dark brownish fuscous streaks, two in fold and two in cell; 9–12 mm."

Tinea familiaris Zeller was found by Prof. Forbes (1931-388) at Coamo and on Vieques Island. He had previously (1930-159) reported it from St. Thomas "taken in a house, and perhaps a clothes-moth in habits."

Tinea minutella (Fabricius) originally described from "Americae insulis" —"not improbably St. Thomas" according to Prof. Forbes (1930-158), has been identified by Mr. Aug. Busck from Puerto Rico for Mr. A. S. Mills who reared an adult from a pupa intercepted on grapefruit at Bayamón. Concerning it, Mr. Busck wrote that it was "a most interesting, striking species which has never been re-discovered since Fabricius' description. No specimen in the British Museum, here (U. S. National Museum), or in Cornell before this." It is a white moth, more or less dusted with gray, both antennae and palpi white; a wing expanse of 9 mm.

Tinea pallidorsella Zeller was found by Prof. Forbes (1931-388) on El Yunque, April 22, 1930. "The ground is wood brown, and in our fresh specimen the dark flecks show a distinct violet iridescence."

Tinea scythropiella Walsingham was collected by Prof. Forbes (1931-388) on Vieques Island and on El Yunque, by Dr. W. A. Hoffman at Palmas

Abajo (between Guayama and Jájome Alto), and at Cataño. It is white, "lightly dusted with brown; an antemedial oblique brown dash from costa, an angulated median band, a spot at end of cell and smaller ones outwardly; 11 mm."

Homostinea tischeriella (Walsingham) was collected by Prof. Forbes (1931-385) on El Yunque, a brown and ochreous species with "a purplish iridescence on the dark part of the fore wing." He identified for Don Julio García-Díaz (1938-96) others that had been collected in his survey of fresh water insects.

Infurcitinea palpella was described by Prof. Wm. T. M. Forbes (1931-386) from material he collected on Vieques Island, others from Cataño, "dark clay color or light wood brown, dusted and marked with grayish fuscous; 8 mm."

Infurcitinea luteella was described by Prof. Wm. T. M. Forbes (1931-386) from moths collected by him on Vieques Island, "luteous, dusted with fuscous, 8 mm."

Mea incudella was described and illustrated (fig. 26 of his colored plate) by Prof. Wm. T. M. Forbes (1931-387) from specimens collected by him on El Yunque, others from Santurce taken by Dr. W. A. Hoffman, "white with black markings; 9 mm."

Mea yunquella was described and illustrated (fig. 25 of his colored plate) by Prof. Wm. T. M. Forbes (1931-388) from a single type found by him "flying about the face of a cliff near the summit of El Yunque; cream color or bone white, marked with black, larger and heavier (than the preceding species), the hind wing wider with more sinuate costa; 10 mm."

Small silvery moths which Mr. Aug. Busck identified as a new species of *Mea* were reared from larvae making long tunnels of silk, in which the excrement was entangled, over bark of trees of *Inga vera* infested by *Xyleborus* beetles at Juana Díaz. The tunnels were of so solid a construction they could be lifted off whole.

Protodarcia argyrophaea was described and illustrated (fig. 28 of his colored plate) by Prof. Wm. T. M. Forbes (1931-390) from moths collected by him at Coamo. It is "a striking species; fore wing light gray-brown, with irregular silvery white transverse lines; 7 mm."

Protodarcia bicolorella was described and illustrated (fig. 27 of his colored plate) by Prof. Wm. T. M. Forbes (1931-389), the type from Coamo, others from Vieques Island, Río Piedras and San Germán. It is "a striking little thing; fore wing dark gray, mottled with black and outwardly with white; 7 mm."

Protodarcia plumella (Walsingham), originally described as a *Tinea* from St. Croix, was collected by Dr. M. D. Leonard at San Germán, as identified by Prof. Forbes (1931-390). Its "fore wing (is) tricolored, with black and ferruginous on white; antenna gray; 6 mm."

Pexicnemidia mirella was described as a new genus and new species by Herr Heinrich B. Möschler (1890-338) from two males collected in Puerto Rico by Dr. Gundlach, and listed by him. Prof. Forbes (1930-159) re-describes it as "fuscous with paler hind wing; immaculate; 14 mm." It has not since been found anywhere.

Acrolophus (Pseudanaphora) arcanellus (Clemens) was re-described by Prof. Forbes (1931-390) examining a small specimen intercepted by Mr. A. S. Mills at Río Piedras. It has also been collected at light at Utuado by Dr. W. A. Hoffman, as identified by Mr. Aug. Busck.

The moth collected at Aguirre by Dr. M. D. Leonard on May 22, 1930, was identified by Prof. Forbes (1931-391) as a new species of *Pseudanaphora*.

Acrolophus (Caenogenes) ochraceus was described as *? Caenogenes* by Herr Heinrich B. Möschler (1890-337) from a single male collected in Puerto Rico by Dr. Gundlach, and listed by him. Prof. Forbes (1930-162) re-described specimens from Coamo as being "light ochre, dusted with red-brown, with three powdery dark brown spots; 20 mm.," and later (1931-393) notes additional collections at Río Piedras, Santurce and Cataño.

Acrolophus (Anaphora) popeanellus Clemens is listed from Puerto Rico by Herr Möschler and Dr. Gundlach, but Prof. Forbes (1930-162) thinks "this record should be verified."

Acrolophus (Anaphora) triformellus was described by Prof. Wm. T. M. Forbes (1930-163), the type from Coamo, others from Manatí, Mayagüez, and Hda. Santa Rita, Guánica. "This appears to be the commonest species of *Acrolophus* in Porto Rico. *A. walsinghami* Möschler—should be rather similar, but the latter is described by Möschler as "brick-red," and he later notes (1931-391) "a series of this species from San Germán tend strongly to a reddish ground, and may turn out to be *walsinghami* Möschler." Mr. E. G. Smyth collected only ten paratypes of this moth at Hda. Santa Rita, Guánica in 1913, eight of these being taken in August, but the following spring he reared several more from dirty brown larvae which he found spinning silken tunnels among trash on the ground. He was doubtful as to the host, but presumably this species was the one of which caterpillars were so numerous at Juncos and Gurabo in the autumn of 1923 as to absolutely eliminate all the grasses in many pastures, altho most of the weeds were untouched. The larvae have been found eaten by the lizards *Anolis pulchellus* and *Anolis cristatellus*.

The rough-looking, dirty brown or reddish-brown adults have been repeatedly intercepted at light at Bayamón, and in recent years have possibly been the most common moths noted at light at Río Piedras.

Acrolophus (Anaphora) triatomellus Walsingham was identified by Prof. Forbes (1931-391) as being six adults which he collected on Vieques Island, "very close to my *triformellus*."

Acrolophus (Acrolophus) harpasen was described by Prof. Wm. T. M. Forbes (1931-391) from type specimens collected by Mr. Francisco Sein at Lares, others from Río Piedras, and one previously reported as *mimasalis* Walker ? from San Juan.

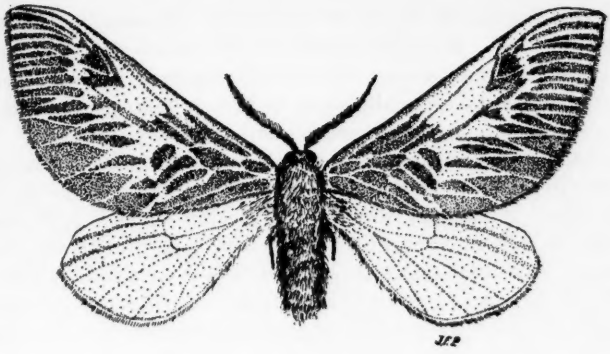
Acrolophus (Acrolophus) plumifrontellus Clemens was listed from Puerto Rico by Herr Möschler and Dr. Gundlach, but Prof. Forbes (1930-165) is of the opinion that "the Porto Rican record (of this continental species) should be verified."

Acrolophus (Acrolophus) vitellus Poey was identified from Puerto Rico by Mr. Aug. Busck, as noted in "Insectae Portoricensis" (1923-206).

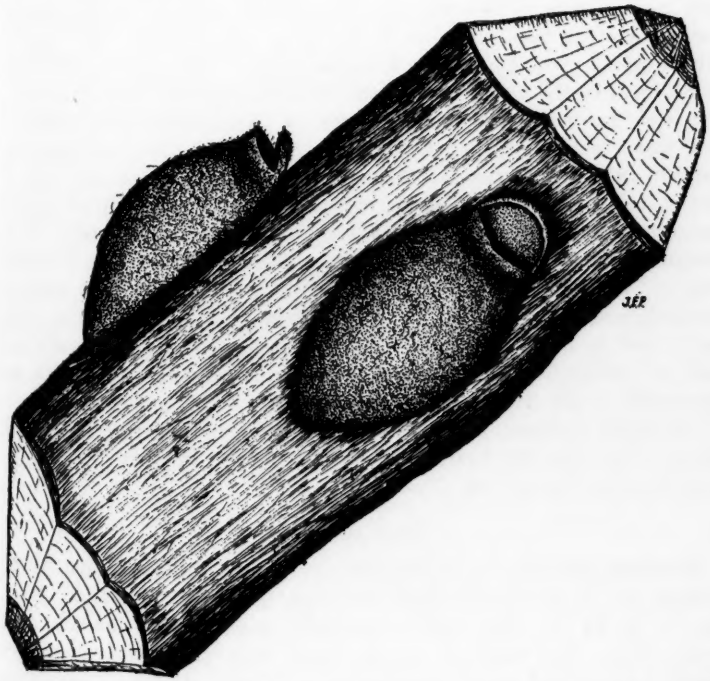
Acrolophus (Acrolophus) walsinghami was described by Herr Heinrich B. Möschler (1890-336) from a male collected in Puerto Rico by Herr Krug, and two males in the Berlin Museum, as noted by Dr. Gundlach. It is mostly "licht ziegelrot," which Prof. Forbes translates as "brick-red" when comparing with his *triformellus*, but (1930-165) describes it as "light cinnamon dusted with brown, with a dark shade through middle of fore wing from base to near outer margin, where there is a separate brown spot; 16 mm." To the non-specialist, this would seem to describe his cotypes of *triformellus* in the Río Piedras Station collection. Or possibly its interpretation depends on the color of bricks in Germany.

Megalopygidae

Megalopyge krugii was described as a *Lagoa* by Dr. Hermann Dewitz (1877-95) the type from Puerto Rico, presumably collected by Herr Krug of Mayagüez. As a *Megalopyga* it is listed by Herr Möschler, and Dr. Gundlach notes "parece ser propia solamente de Puerto Rico." The "plumilla" of Puerto Rico was possibly most intensively studied at Mayagüez by Mr. R. H. Van Zwaluwenburg, who lists it as number 1662; on *Inga vera*, *Terminalia catappa* and coffee, and (1915-31) gives *Inga laurina* as an additional host plant of the hairy white caterpillar. He continues (1915-34), "the larva is covered with long white hairs and is provided with brittle spines which cause a burning sensation if allowed to come in contact with the (human) skin. The pupa-case, with a 'trap-door' exit at one end, 16 by 10 mm., is formed of the hairs of the larva mixed with a substance secreted by the mature larva." Some persons are much more susceptible to poisoning by these innocent-looking little caterpillars, and suffer ugly lesions if they accidentally happen to come in contact with them. They occur in all parts of the Island, and tend to be omnivorous in their feeding habits, Dr. Luis F. Martorell (1948-546) listing eighteen other forest or roadside trees on the trunks of which their cocoons have been noted. The concrete posts guarding the edge of the causeway and bridge of the Arecibo River in 1938 were thickly covered with cocoons, altho the



Adult of the "Plumilla," *Megalopyge krugii* (Dewitz), two and a half times natural size. (Drawn by José F. Pietri.)



Cocoons of the "Plumilla," *Megalopyge krugii* (Dewitz), from which the adults have emerged, two and a half times natural size. (Drawn by José F. Pietri.)

larvae had fed on the leaves of "almendro" (*Terminalia catappa*) trees shading the road. When the moth leaves the cocoon the latter is promptly taken over as a most secure and desirable residence by small spiders and many small insects, especially small cockroach nymphs, and ants, for the plastic of which it is formed resists weathering for a long time. The flat "trap-door" is at the top, however, so it can not be as weather-proof as they might wish. If the larva has been parasitized by one of the Chalcid wasps, *Brachymeria* spp., some of the uneaten remains of the caterpillar will also be present to furnish food as well as shelter to the first insect finding its way inside the cocoon. The adult is described by Prof. Forbes (1930-166) as being "gray or light buff, with numerous white lines on and between veins, and some white transverse shading on disc; 25–30 mm."

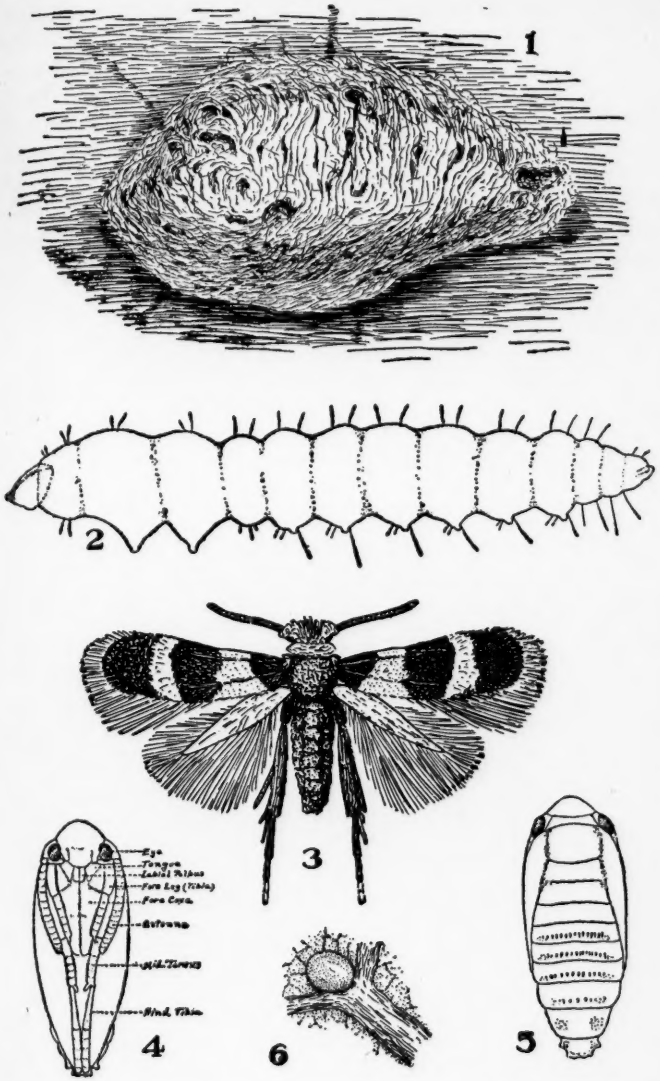
Limacodidae

Monoleuca albicollis was described by Prof. Wm. T. M. Forbes (1930-167) from a type collected at Coamo, June 5–7, 1915, mostly buff in color, with wing expanse of half an inch. Apparently without having seen the cocoon, Prof. Forbes describes it as being "substantially like that of *Megalopyge*." Drs. Donald De Leon and Luis F. Martorell in April 1940 found them on the upper surface, and sometimes on the underside, of the leaves of "maricao" (*Byrsonima spicata*) at Doña Juana Camp, Villalba, from which moths were reared that were determined by Mr. Carl Heinrich. Later in 1940, Dr. Martorell found additional cocoons on the same host at Cayey, and on "cedro" (*Cedrela mexicana*) at Cayey, on West Indian mahogany, and on "maga" (*Montezuma speciosissima*) at Isabela. It is presumed that the caterpillars fed on the leaves of these trees, but they have not been found. Dr. Martorell (1948-549) describes the cocoon as "whitish, mottled with brown, or vice versa; about 5 mm. long, 4 mm. wide and 4 mm. in height; made of a parchment-like substance, smooth and hard in consistency like a lizard's or very small bird's egg, with an operculum at one end."

The single specimen of an adult in the Cornell University collection, taken at Lares by Mr. Francisco Seín, was figured in Seitz' "Macrolepidoptera of the World," vol. 6, pl. 168, fig. g7.

Nepticulidae

Nepticula gossypii was described by Drs. Wm. T. M. Forbes and M. D. Leonard as "A New Leaf-Miner of Cotton in Porto Rico" (Jour. Dept. Agr. P. R., **14** (3): 151–7, pl. 2, San Juan, August 1930), the type from Juana Díaz. The moth is "purple black, with two transverse silvery bands; tuft on head tawny, eye-caps cream; 3 mm.; the larva a serpentine miner on the under side of cotton leaves." It is quite common on the



Nepticula gossypii Forbes & Leonard: 1, cocoon, 2, larva, 3, adult, 4 & 5, pupae, 6, egg. (After Forbes & Leonard.)

south coast, from Guayanilla to Yauco, in the spring, but "exceeding rare if present at all on the north coast or on Vieques Island." It was noted in the leaves of wild cotton on Mona Island, and Mr. C. F. Rainwater, reporting on "Insects and a Mite of Potential Economic Importance found on Wild Cotton in Florida" (Jour. Ec. Ent., **27** (4): 756–761, ref. 4. Geneva, August, 1934), found it on Anglefish Key, Key Largo, Cape Sable and around Ft. Myers, Florida, causing severe shedding of the foliage. Larvae have also been noted in the leaves of hollyhocks in the greenhouse at Río Piedras. Prof. Forbes (1931-393) reports an undescribed species of *Nepticula* from Coamo.

Actual date of publication: May, 1951.

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